

## Construction Completion Report

BRIO Lofts (Solterra Property)  
3912 North Vancouver Avenue  
Portland, Oregon 97227

ECSI #6219

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## **INTRODUCTION**

This Construction Completion Report (CCR) has been prepared by Point Source Solutions, LLC for the Site identified as the Brio Lofts, located at 3912 North Vancouver Avenue in Portland, Oregon (Site) on behalf of Vibrant Cities, LLC for the purpose of achieving regulatory closure. This report summarizes work completed in regard to the impacts to soil and soil-vapor previously documented at the Site. Additionally, this report details the remedial actions taken for the management and removal of impacted soils at the Site, documents the results for confirmation samples, and documents the implementation of mitigative components of construction and engineering controls to address the potential for vapor migration into indoor urban residential and occupational spaces.

## **BACKGROUND**

### ***PREVIOUS INVESTIGATIONS & ODEQ CORRESPONDENCE***

From 2014 to 2017, environmental investigations identified the presence of petroleum contaminated soils (PCS) and multiple underground storage tanks (USTs) throughout the Site from past activities associated with a former service station and auto repair business located on the Site from 1936 through 1964. The investigations and resulting cleanup reports prepared by Point Source Solutions LLC (Point Source) are summarized as follows:

- Environmental Subsurface Investigation, Portland, Oregon dated July 8, 2014, prepared by Point Source Solutions LLC. Project #OR140603-6;
- Underground Storage Tank Closure and Soil Cleanup Report, LUST Facility #26-14-1732, Portland, Oregon dated February 23, 2015, prepared by Point Source Solutions LLC. Project #OR141117-3; and
- Subsurface Environmental Investigation, Portland, Oregon dated August 8, 2017, prepared by Point Source Solutions LLC. Project #OR170712-3.

In 2014, NRC Environmental Services (NRC) with oversight by Point Source decommissioned 3 USTs and a hydraulic hoist by removal. PCS was encountered, then excavated with a total of 23.99 tons being transported to the Waste Management Hillsboro Subtitle D Landfill. The former location of these USTs is shown in **Figure 4**.

In June 2017, an additional subsurface investigation was conducted to assess the extent of PCS encountered during a geotechnical boring advanced in by Carlson Geotechnical (CGT) in the southwest portion of the Site. The June investigation found PCS at depths ranging from 9 to 50 feet bgs and identified areas in the southwest portion of the Site where both gasoline and naphthalene exceeded the ODEQ screening level for the Vapor Intrusion into Buildings pathway for urban residential development.

Point Source prepared a memorandum dated April 17, 2018, addressing the risk associated with the documented impacts to soil and soil vapor and the recommended remedial actions that were to take place during redevelopment, which was anticipated to be a multi-story mixed-use “urban residential” structure with subgrade parking and the proposed engineering controls to address the potential for vapor migration into indoor air. Point Source recommended the removal of PCS to a minimum depth of 18 feet bgs, which was expected to result in a significant reduction in the mass of highly impacted soils and create a buffer of clean compacted materials between the impacted soil plume and the base of the proposed development. Also included was the recommendation for the installation of a passive vapor mitigation system with a 40-mil thick liner of Absolute Barrier® Y40BAC manufactured by Raven Industries.

Following a review of the project file to date and a memorandum dated April 17, 2018 prepared by Point Source Solutions including cross-sections explaining the then current understanding of the impacted soils at the Site, Oregon Department of Environmental Quality (ODEQ) Project Manager Robert Hood agreed with the redevelopment plan and requested an engineering plan for the vapor mitigation system stamped by a Oregon Registered Professional Engineer. As a part of the approved plan, ODEQ would draft an Easement and Equitable Servitudes (EES) that would be imposed on the proposed vapor mitigation system as an engineering control. PBS Engineering & Environmental Inc (PBS) was contracted to design the passive vapor mitigation system. In addition, Mr. Hood, requested the collection of additional soil vapor samples on the south and west adjoining properties where residential development was present. The resulting report is summarized as follows:

- Soil Gas Vapor Testing Results, Memorandum, dated August 21, 2018, prepared by Point Source Solutions LLC.

The soil gas testing identified gasoline-range hydrocarbons and volatile organic compounds (vinyl chloride, chloroform, benzene, trichloroethene, tetrachloroethene, ethylbenzene and naphthalene) in and immediately outside the impacted soil plume at concentrations that exceed the ODEQ screening level for the Vapor Intrusion into Buildings pathway for urban residential receptors. The plume appeared to be confined to the Site and contaminants of interest did not exceed the ODEQ Vapor Intrusion into Buildings for residential receptors in samples on south and west adjoining properties.

Laboratory analytical sample results for all previous investigations are summarized in **Tables 1 through 6** attached to this report for reference.

### **PHYSICAL SETTING**

The Site is situated near the outlet of the Columbia River Gorge where it intersects with the Willamette Valley (Orr, Orr, Baldwin, 1992). Sediments collected in this area record multiple Ice Age floods that originated in Montana, poured through the Cascades via the Columbia River, and backed up in the valley before eventually draining to the Pacific Ocean. The Site is located at approximately 186 feet above mean sea level.

The Site is mapped primarily as Urban Land-Latourell Complex. Urban Land is soil that has been disturbed and modified by streets, buildings, and other structures. The Latourell Complex is found on terraces. The parent material of this soil is medium textured alluvium. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high.

According to a well log search conducted on the Oregon Water Resources website, no significant shallow groundwater resources have been encountered in wells advanced in close proximity to the Site. Water bearing zones were defined in excess of 100 feet below ground surface in wells advanced in the vicinity of the Site. The water-bearing units within the area are comprised of alluvium. No on-site water wells or springs were observed during Site activities. Domestic water is supplied to the Site by the City of Portland.

Based on a review of the Portland, Oregon Quadrangle 7.5-minute series topographic map, the inferred groundwater flow at the Site is to the southwest towards the Willamette River (approximately 0.94 miles to the west). The Site does not overlie a sole source aquifer. According to the USEPA Ground Water Handbook, Vol.1 Ground Water and Contamination, September 1990, the water table typically conforms to surface topography.

Soil encountered during previous investigations and redevelopment activities consisted primarily of well graded sand and silt.

## **SITE REDEVELOPMENT**

The Site redevelopment included construction of a five-story mixed-use (urban residential) building consisting of residential units over ground floor businesses with one level of sub-grade parking. The subgrade parking garage is equipped with a dedicated continuously operating interior ventilation system with a minimum 600 cfm at standby and 4.5 air changes per hour (confirmed by John Maddox, PE, Seabold Construction Company), separate from the passive sub-slab ventilation system installed as an engineering control. According to the 2019 Oregon Mechanical Specialty code, enclosed parking garages must be equipped with automatic mechanical ventilation that operates full-on at an airflow rate of not less than 0.75 cfm per square foot of the floor area served, and standby at an airflow rate of not less than 0.05 cfm per square foot of the floor area served. The building footprint encompasses approximately 12,197 square feet, and the mechanical ventilation system installed meets this requirement.

The Site is identified on a Site Location Map (**Figure 1**), Topographic Map (**Figure 2**), and Site Plan with a layout of the building footprint (**Figure 3**), all of which are located in the Figures section attached to this report.

## **PRE-DEVELOPMENT ACTIVITIES**

Point Source's understanding of the pre-development subsurface conditions is based on previous investigations conducted at the project site between 2014 and 2017 (discussed in above Background section).

## **UST DECOMMISSIONING**

In December 2018, Point Source was informed of two additional USTs encountered during Site redevelopment in the southwest portion of the Site. One located under the City of Portland right-of-way (ROW) parallel to NE Failing Street, and the other located 2 feet north within the Site boundary. The tanks were 3.8 in diameter and 12 feet in length, both with a rated volume of 1,000 gallons. Both tanks were buried 4 feet below ground surface.

Prior to decommissioning activities, Point Source obtained PBOT ROW UST Decommissioning Permit # TR-18-134 and Portland Fire & Rescue Permit # 19-100223000-00-FS. Copies of the UST Decommissioning Permits are included as **Appendix A**.

On January 9, 2019, Point Source oversaw decommissioning activities by NRC and Seabold Construction Company, Inc. (Seabold). The top of the tanks were exposed, accessed, and the interiors were tested with a Combustible Gas Indicator (CGI) to confirm that it was safe to cut open. NRC removed approximately 350 gallons of water from one tank and approximately 200 gallons of water from the second tank. No product was found in either tank. Following the removal of liquids, NRC rinsed the interior of each tank. A sample of the tank water was collected and submitted for waste characterization.

On January 11, 2019, both tanks were removed from the ground and transported off-site for recycling as scrap. Staining and odors indicative of a petroleum hydrocarbon impact was noted in the UST cavity following removal. Further excavation of the contaminated soils was put on hold until the surrounding grade could be reduced, and perimeter shoring was started. A map showing the former tank soil sample locations is included in **Figure 4**.

Initial soil samples were collected directly from the excavator bucket following completion of decommissioning activities and UST removal. All soils represented by the results of the UST soil samples were excavated and transported to the Waste Management Hillsboro Subtitle D Landfill for disposal under profile #129414OR and were collected as follows:

- Sample NWTE-S1 was collected from the floor of the UST excavation at 8.0 feet bgs at the northwest tank end.

Indications of soil contamination in the form of staining, odor, or volatile organic compound (VOC) detections with a hand-held photo-ionization detector (PID) were noted in this location. A soil sample was collected from the bucket of an excavator.

- Sample NETE-S1 was collected from the floor of the UST excavation at 8.0 feet bgs at the northeast tank end. Indications of soil contamination in the form of staining, odor, or VOC detections with a PID were noted in this location. A soil sample was collected from the bucket of an excavator.
- Sample SWTE-S1 was collected from the floor of the UST excavation at 8.0 feet bgs at the southwest tank end. Indications of soil contamination in the form of staining, odor, or VOC detections with a PID were noted in this location. A soil sample was collected from the bucket of an excavator.
- Sample SETE-S1 was collected from the floor of the UST excavation at 8.0 feet bgs at the southeast tank end. Indications of soil contamination in the form of staining, odor, or VOC detections with a PID were noted in this location. A soil sample was collected from the bucket of an excavator.

Samples were transported under chain of custody to Wy'East Environmental Sciences, Inc. (Wy'East), a state-accredited laboratory, for analysis by Method NWTPH-Dx (diesel and heavy oil-range petroleum hydrocarbons) and NWTPH-Gx (gasoline-range petroleum hydrocarbons).

Laboratory analytical sample results are summarized in **Table 1 (December 2019 UST Soil Sample Results)** attached to this report. Copies of the laboratory analytical reports are provided in **Appendix B**.

At the request of ODEQ, a decommissioning checklist and registration form for the two USTs were prepared by Point Source and submitted to Mark Drouin of ODEQ on July 26, 2021. A copy of the checklist and registration form is included as **Appendix C**.

## **DEVELOPMENT ACTIVITIES**

### ***SOLDIER PILE INSTALLATION***

In January 2019, Point Source provided construction observation and media management services starting with the oversight of the soldier pile wall installation for the lateral support shoring retention system of the building foundation by DeWitt Construction Inc (DeWitt) which, based on the previous investigations, was expected to encounter PCS in the southwest portion of the Site. The 35 foot "I" beams or "piles" are a permanent installation combined with timber lagging to create the shoring wall and retention system.

Between January 7 and 17, 2019, Point Source oversaw the installation of 24 soldier piles to a depth of 35 feet bgs. Point Source documented 9 of the 24 observed piles to have encountered PCS at depths ranging from 20-35 feet bgs, all in the southwest portion of the Site. All contaminated soil encountered during pile driving activities was transported to the Waste Management Hillsboro Subtitle D Landfill for disposal under profile #129414OR. Soldier Pile locations are included in **Figure 5**.

Piles installed in the subsurface are generally understood to be a preferential pathway for contamination to spread vertically downward. However, because the depth to groundwater has been demonstrated to be at least 100 feet below ground surface in the vicinity of the Site and the piles only extend to 35 feet below ground surface, there is no potential for the downward migration of contamination to enter the water table. Additional soil sampling to further characterize the southwest portion of the Site was regarded as unnecessary as the extent of contamination had already been characterized as per previous investigations and ESCI File #6219, Memorandum,

dated April 17, 2018, prepared by Point Source.

### **EXCAVATION OF CONTAMINATED SOILS**

In February 2019, Point Source oversaw the removal of contaminated soils during the construction of the shoring retention system in which the overall Site grade (mass excavation) was brought down 15-21 feet bgs to accommodate the subgrade parking garage, elevator shafts, and building infrastructure. Multiple lens of PCS was encountered in the soil profile at depths ranging from 8 to 15 feet bgs mostly in the central and southwestern portion of the building footprint which varied in thickness from 2 to 7 feet. PCS was identified using visual and olfactory observations, as well as field screening using a handheld photoionization detector (PID). Excavation of the Site continued on an as-needed basis for the remainder of the shoring and grading process. All areas of PCS encountered during the mass excavation are shown on **Figure 5** and represent both removed and remaining portions of the known plume. No groundwater was encountered during excavation activities.

Contaminated soil generated during grading activities was transported to the Waste Management Hillsboro Subtitle D Landfill for disposal under Profile #129414OR. In total, remedial actions overseen by Point Source in January and February 2019 resulted in the removal and disposal of 441.7 tons of impacted soil. A copy of the transaction history of profile #129414OR is included as **Appendix D**.

### **CONFIRMATION SAMPLING**

On February 20, 2019, confirmation soil samples were collected from the floor of the mass excavation where visual observations or PID field screening indicated that PCS may be present. Samples were collected at a frequency of one confirmation sample per 400 square feet to characterize the soils remaining below the subgrade parking garage. Point Source conducted the sampling as follows:

- Sample SG1 was collected from the terminal depth of the mass excavation at 15.0 feet bgs using the bucket of an excavator in a small area of visually observed PCS that spread downward through the soil profile from the plume created from the former USTs removed in 2019. Indications of soil contamination in the form of visual staining, odor, or VOC detections with a PID were noted in this location at the final grade and an estimated 78.5 square feet of stained soil remain in this location based on visual observations.
- Sample SG2 was collected from the terminal depth of the mass excavation at 15.0 feet bgs using the bucket of an excavator in an area where previously identified PCS was encountered in the upper zone in the soil profile from the former USTs removed in 2014. No indications of soil contamination in the form of visual staining, odor, or VOC detections with a PID were noted in this location at the final grade.
- Sample SG3 was collected from the south sidewall of the mass excavation at 8.0 bgs between two soldier piles before the installation of the timber lagging using the bucket of an excavator where previous identified PCS was encountered during excavation activities from the former USTs removed in 2019 and the pile installation activities. This sample was collected to represent lateral delineation and soil conditions behind the future south subgrade basement wall. No indications of soil contamination in the form of staining, odor, or VOC detections with a PID were noted in this location at the final grade.

Soil samples were transported under chain of custody to Wy'East. The samples were analyzed for NWTPH-Dx and EPA Method 8260 for volatile organic compounds (VOCs).

Laboratory analytical sample results are summarized in **Table 2 (Confirmation Soil Sample Results)** attached to this report. Copies of the laboratory analytical reports are provided in **Appendix B**.

Laboratory QA/QC measures were performed through data validation of available analytical data generated as part of these sampling events. Data validation considered the following:

- Method Detection and/or Reporting Limits
- Laboratory Matrix Blanks
- Sample Holding Times
- Surrogate and Matrix Spike Recoveries, and
- Laboratory Duplicate Analysis Results

Wy'East did not report qualifiers that would indicate problems with the sample results. According to the lab reports all analyses were performed with the appropriate Batch QC (including Sample Duplicates, Matrix Spikes and/or Matrix Spike Duplicates) in order to meet or exceed method and regulatory requirements. Exceptions are qualified in the analytical report. In cases where there is insufficient sample material provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) is analyzed to demonstrate accuracy and precision of the extraction and analysis.

## **CONCEPTUAL SITE MODEL**

### ***Primary Sources, Nature, and Extent of Contamination***

Primary sources of historical contamination include the following.

- A release of gasoline and diesel range petroleum hydrocarbons and various VOCs to soil, which has resulted in soil gas impacts.

From 2014 to 2017, environmental investigations identified the presence of petroleum contaminated soils (PCS) and multiple underground storage tanks (USTs) throughout the Site from past activities associated with a former service station and auto repair business located on the Site from 1936 through 1964. The investigations and resulting cleanup reports prepared by Point Source Solutions LLC (Point Source) are summarized as follows:

- Environmental Subsurface Investigation, Portland, Oregon dated July 8, 2014, prepared by Point Source Solutions LLC. Project #OR140603-6;
- Underground Storage Tank Closure and Soil Cleanup Report, LUST Facility #26-14-1732, Portland, Oregon dated February 23, 2015, prepared by Point Source Solutions LLC. Project #OR141117-3; and
- Subsurface Environmental Investigation, Portland, Oregon dated August 8, 2017, prepared by Point Source Solutions LLC. Project #OR170712-3.

In 2014, NRC Environmental Services (NRC) with oversight by Point Source decommissioned 3 USTs and a hydraulic hoist by removal. PCS was encountered, then excavated with a total of 23.99 tons being transported to the Waste Management Hillsboro Subtitle D Landfill. The former location of these USTs is shown in **Figure 4**.

In August 2017, an additional investigation was conducted to assess the extent of PCS encountered during a geotechnical boring advanced in June 2017 in the southwest portion of the Site. The August investigation found PCS at depths ranging from 9 to 50 feet bgs and identified areas in the southwest portion of the Site where both gasoline and naphthalene exceeded the ODEQ screening level for the Vapor Intrusion into Buildings pathway for

urban residential development.

Following a review of the August 2017 subsurface environmental investigation, ODEQ Project Manager Robert Hood requested the collection of additional soil-gas samples on the Site, and on south and west adjoining properties where residential development was present. The resulting reports are summarized as follows:

- Soil Gas Vapor Testing Results, Memorandum, dated April 21, 2018, prepared by Point Source Solutions LLC.

The soil gas testing identified as gasoline-range organics (GROs) and volatile organic compounds (VOCs) (vinyl chloride, chloroform, benzene, trichloroethene, tetrachloroethene, ethylbenzene and naphthalene) in and immediately outside the impacted soil plume at concentrations that exceed the ODEQ screening level for the Vapor Intrusion into Buildings pathway for urban residential receptors. The plume appeared to be confined to the Site and contaminants of interest did not exceed the ODEQ Vapor Intrusion into Buildings for residential receptors in samples on west and south adjoining properties.

In December 2018, Point Source was informed of two additional USTs encountered during Site redevelopment in the southwest portion of the Site. One was located under the City of Portland ROW parallel to NE Failing Street, and the other located 2 feet north within the Property boundaries. The tanks were 3.8 in diameter and 12 feet in length, both with a rated volume of 1,000 gallons. Both tanks were buried 4 feet below ground surface.

On January 9, 2019, Point Source oversaw decommissioning by removal activities by NRC and Seabold. Initial soil sample collected at the base of the USTs detected diesel at concentrations exceeding above applicable RBCs for the Site and were excavated and transported to the Waste Management Hillsboro Subtitle D Landfill for disposal under profile #129414OR during Site redevelopment.

### Contaminants of Concern

To identify compounds detected in Site soil and soil vapor that are most likely to be of concern to human health, detected concentrations of these contaminants were compared to a series of risk-based screening criteria that cover the range of potential human activities that may be practiced on the Site currently or in the future.

Compounds with detected concentrations were identified as being COIs. It should be noted that the identification of COIs does not indicate that an unacceptable risk or that a threat exists. Also, COI identification does not necessarily indicate that remediation of a specific environmental media is required. Screening criteria are purposely conservative so chemicals that may contribute to Site risk can be further evaluated. **The COIs for the Site include TPH, various VOCs and metals detected in soil, and soil vapor samples and only represent soils remaining on Site at depths beneath the 40-mil thick liner of Absolute Barrier® Y40BAC sub-slab vapor barrier.**

CONTAMINANTS OF INTEREST				
Contaminant	Depth (Soil)	Soil Max Concentration (mg/kg)	Depth (Soil Vapor)	Soil Gas Max Concentration (ug/m <sup>3</sup> )
TPH – Gx/GRO	32.0'	6,710	42.0'	470,000
TPH - Dx	15.0'	7,210	N/A	Not Analyzed
Benzene	30.0'	None Detected	30.0'	330
Ethylbenzene	40.0'	0.207	30.0'	970
Trichloroethene	30.0'	None Detected	30.0'	6,900

CONTAMINANTS OF INTEREST				
Contaminant	Depth (Soil)	Soil Max Concentration (mg/kg)	Depth (Soil Vapor)	Soil Gas Max Concentration (ug/m <sup>3</sup> )
Tetrachloroethene	30.0'	None Detected	30.0'	2,000
Vinyl Chloride	30.0'	None Detected	30.0'	42
Xylenes	40.0'	0.555	30.0'	4,200
135-TMB	40.0'	1.127	42.0'	520
124-TMB	15.0'	0.304	42.0'	660
Chloroform	30.0'	None Detected	30.0'	430
Trichlorofluoromethane	30.0'	None Detected	30.0'	1,700
1,1-Dichloroethene	30.0'	None Detected	30.0'	2,600
1,1-Dichloroethane	30.0'	None Detected	30.0'	580
1,2-Dichloroethane (EDC)	30.0'	None Detected	30.0'	140
1,1,1-Trichloroethane	30.0'	None Detected	30.0'	6,300
Carbon Tetrachloride	30.0'	None Detected	30.0'	220
Toluene	30.0'	None Detected	30.0'	11,000
Styrene	30.0'	None Detected	30.0'	81
Chloromethane	42.0'	None Detected	42.0'	6.6
Naphthalene	40.0'	1.9	42.0'	380
Acenaphthene	40.0'	0.4	N/A	Not Analyzed
Fluorene	40.0'	1.2	N/A	Not Analyzed
Anthracene	40.0'	0.1	N/A	Not Analyzed
Arsenic	30.0'	1.75	N/A	Not Analyzed
Barium	30.0'	115	N/A	Not Analyzed
Cadmium	30.0'	0.347	N/A	Not Analyzed
Chromium	30.0'	10.5	N/A	Not Analyzed
Lead	30.0'	4.66	N/A	Not Analyzed

**Table Notes:**

COIs that have concentrations less than one or more RBCs can be screened out. Constituents that remain after the screening are COPCs and have been highlighted in yellow. The COPCs have been carried forward for the risk screening discussed below in **Risk Assessment**.

**Extent of Contamination**

**Soil**

A single detection of gasoline in soil sample SB11B-1-32 (detected in the August 2017 Subsurface Investigation) at a maximum concentration (6,710 mg/kg) representing Site soil conditions was detected above the Urban

Residential  $RBC_{si}$  for Vapor Intrusion into Buildings of 94 mg/kg, however this sample was collected at 32 feet bgs, therefore 17 feet below the sub-slab vapor barrier and passive vapor mitigation system.

Based on the field observations made during the mass excavation and soldier pile installation, TPH-Dx remains in place above Urban Residential  $RBC_{ss}$  for Soil Ingestion, Dermal Contact, and Inhalation at 15.0 feet bgs. The locations of remaining PCS at the site are discussed as follows:

- An approximate 78.5 square foot lens of TPH-Dx observed by visual observations and confirmed by soil sample SG1-S1-15 collected from the floor of the mass excavation at 15 feet bgs in close proximity to antecedent soil boring SB11/SB11B. Vertical delineation was not possible, and for access reasons could not be determined in the field during the excavation activities. Therefore, a conservative assumption that contamination terminates vertically between 50 to 60 feet bgs is assumed based on nearby soil boring SB11 and SB11B. Based on this assumption, approximately 167 cubic yards of contaminated soil lie beneath the Site in the area confirmed by SG1-S1-15 at a depth of 15 to 60 feet bgs.
- An approximate 369 square foot lens observed using visual and olfactory observations during pile driving activities in the southwest corner of the Site, extending from 20 feet bgs to the base of the piles at 35 feet bgs. The size of the plume at the base of the piles is only known by field observations and results from the August 2017 Subsurface Investigation. Therefore, a conservative assumption that contamination terminates vertically between 50 to 60 feet bgs is assumed and it is estimated that 615 cubic yards of PCS extends beneath the Site near the southern property line at a depth of 20 to 50 feet bgs.

Soil sample laboratory analytical results are summarized in **Table 2** and **Table 5**, including reference to the August 2017 Subsurface Investigation for further details.

### ***Soil Gas***

Gasoline-range Organics (GRO) that remain on Site were detected at a maximum concentration of 470,000  $\mu\text{g}/\text{m}^3$  above the Urban Residential  $RBC_{sv}$  for Vapor Intrusion into Buildings of 79,000  $\mu\text{g}/\text{m}^3$  in soil vapor sample (SV5) collected at a depth of 42 feet bgs beneath the known PCS plume. This sample location also represents the highest concentration of Naphthalene (380  $\mu\text{g}/\text{m}^3$ ) detected above the Urban Residential  $RBC_{sv}$  for Vapor Intrusion into Buildings of 39  $\mu\text{g}/\text{m}^3$ . Lower concentrations of GRO (120,000  $\mu\text{g}/\text{m}^3$ ) and selected VOCs including vinyl chloride, chloroform, benzene, trichloroethene, tetrachloroethene, ethylbenzene and naphthalene were detected in soil vapor samples (SV1, SV2, and SV3) collected at a depth of 30 feet bgs within the known PCS plume above Urban Residential  $RBC_{sv}$  for Vapor Intrusion into Buildings, however below the Occupational  $RBC_{sv}$  for Vapor Intrusion into Buildings.

Soil vapor sample laboratory analytical results are summarized in **Table 6**, including reference to the 2018 Soil Gas Investigation for further details.

### ***Exposure Pathway Summary***

#### ***Exposure Pathways for Soil***

The following summarizes the exposure pathways for soil.

- Soil Ingestion, Dermal Contact, and Inhalation ( $RBC_{ss}$ ) – This exposure pathway is considered incomplete for all current and future occupational and urban residential receptors, as impacted soils are not accessible. This pathway is considered potentially complete for excavation workers, as impacted soil may become accessible

during future construction work.

- Volatilization to Outdoor Air ( $RBC_{so}$ ) – This pathway is considered potentially complete for all current and future receptors as impacted soils are present.
- Vapor Intrusion into Buildings ( $RBC_{si}$ ) – This pathway is considered potentially complete for all current and future receptors as impacted soils are present.
- Leaching to Groundwater ( $RBC_{sw}$ ) – This pathway is considered incomplete for all current and future receptor scenarios, as the beneficial use of water survey conducted for the Site did not identify use of shallow groundwater as a source of drinking water at the Site or Site vicinity, and impacted groundwater is not present.

### ***Exposure Pathways for Groundwater***

The following summarizes the exposure pathways for groundwater.

- Ingestion and Inhalation from Tapwater ( $RBC_{tw}$ ) – This pathway is considered incomplete, as the beneficial use of water survey detailed in below conducted for the Site did not identify use of shallow groundwater as a source of drinking water at the Site or Site vicinity.
- Volatilization to Outdoor Air ( $RBC_{wo}$ ) – This pathway is considered incomplete, as the beneficial use of water survey detailed in below conducted for the Site did not identify use of shallow groundwater as a source of drinking water at the Site or Site vicinity.
- Vapor Intrusion into Buildings ( $RBC_{wi}$ ) – This pathway is considered incomplete, as the beneficial use of water survey detailed in below conducted for the Site did not identify use of shallow groundwater as a source of drinking water at the Site or Site vicinity.
- Groundwater in Excavation ( $RBC_{we}$ ) – This pathway is considered incomplete, as the beneficial use of water survey detailed in below conducted for the Site did not identify use of shallow groundwater as a source of drinking water at the Site or Site vicinity.

### ***Exposure Pathways for Soil Gas***

The following summarizes the exposure pathways for soil.

- Vapor Intrusion into Buildings ( $RBC_{sv}$ ) – This pathway is considered complete for all current and future receptor scenarios, as impacted soil-gas vapor is present.

### ***Conceptual Site Model***

A Conceptual Site Model (CSM) defines the potentially complete exposure pathways through which human or ecological receptors may be exposed to site contaminants under current or anticipated future land use conditions. A discussion of Site geology and hydrogeology, potential contaminant sources, and the nature and extent of contamination are presented above. An evaluation of current and reasonably likely future receptor-exposure pathway analysis is presented below.

The Summary of the CSM, which includes the reasoning for accepting or rejecting exposure scenarios, is presented in the table below.

SUMMARY OF CSM			
Pathway	Receptor	Applicable RBC	Basis for selection/exclusion
<b>SOIL</b>			
Ingestion, Dermal Contact, and Inhalation	Residential	Yes	Impacted soils are present.
	Urban Residential (Current and Future)	Yes	
	Occupational (Current and Future)	No	Soil concentrations did not exceed Occupational receptor RBCs.
	Construction Worker (Future)	Yes	Impacted soils are present.
	Excavation Worker (Future)	Yes	
Volatilization to Outdoor Air	Residential	Yes	Impacted soils are present.
	Urban Residential (Current and Future)	Yes	
	Occupational (Current and Future)	No	Soil concentrations did not exceed Occupational receptor RBCs.
Vapor Intrusion into Buildings	Residential	Yes	Impacted soils are present.
	Urban Residential (Current and Future)	Yes	
	Occupational (Current and Future)	Yes	
Leaching to Groundwater	Residential	Yes	Impacted soils are present.
	Urban Residential (Future)	Yes	
	Occupational (Current and Future)	Yes	
<b>GROUNDWATER</b>			
Ingestion and Inhalation from Tapwater	Residential	No	No shallow groundwater at the Site and the beneficial use of water survey conducted for the Site did not identify use of shallow groundwater as a source of drinking water at the Site or Site vicinity.
	Urban Residential (Current and Future)	No	
	Occupational (Current and Future)	No	
Volatilization to Outdoor Air	Residential	No	No shallow groundwater at the Site
	Urban Residential (Current and Future)	No	
	Occupational (Current and Future)	No	
Vapor Intrusion into Buildings	Residential	No	No shallow groundwater at the Site
	Urban Residential (Current and Future)	No	

SUMMARY OF CSM			
Pathway	Receptor	Applicable RBC	Basis for selection/exclusion
	Occupational (Current and Future)	No	
Groundwater in Excavation	Construction and excavation workers (Future)	No	No shallow groundwater at the Site

### ***Beneficial Land and Water Use Determinations***

The purpose of the BLWUD is to collect and document information regarding the current and reasonably likely future beneficial uses of land and water in the locality of the facility (LOF). Beneficial use determinations provide the basis for the development of exposure scenarios discussed later in this report. The BLWUD was completed in accordance with the ODEQ's Guidance for Conducting Beneficial Water Use Determinations at Environmental Cleanup Sites (ODEQ, 1998) and Guidance for Consideration of Land Use (ODEQ, 1998).

### ***Summary of Land Use***

The current zoning of the Site is CM3 (Commercial Mixed Use). The CM3 zone is a medium-scale, commercial mixed-use zone intended for sites in a variety of centers and corridors, in other mixed use areas that are well served by frequent transit, or within larger areas zoned for multi-dwelling development. Buildings in this zone are generally expected to be up to four stories, except in locations where bonuses allow up to five stories.

Adjoining properties are zoned as Commercial Mixed Use (CM3) to the north, east and south. The adjoining property to the west is zoned Residential 2,500 (R2.5), which allows 1 lot per 2,500 ft<sup>2</sup>. The major types of new housing development will be limited to single family dwellings, rowhouses, duplexes, triplexes, fourplexes and accessory dwelling units (ADU).

Point Source has considered this zoning as part of the CSM.

### ***Summary of Water Use***

The Site and surrounding properties are provided water by the City of Portland. According to the 2022 City of Portland Water Quality Report, Portland's water system is supplied from two sources – Bull Run Watershed and the Columbia South Shore Well Field. Water flows from the Bull Run Watershed held by a reservoir and concrete diversion dam to the Headworks Water Treatment Facility, where it is treated and sent to Powell Butte Underground Reservoirs merging with the supply from Columbia South Shore Well Field.

Based on our review of the available data information from the City of Portland, the Site and immediately surrounding areas are connected to the municipal water supply system.

The Site (1N1E22DC 00800) is located in the SW ¼ of the SE ¼ of Section 22, T.1N, R.1E. Point Source performed a search using the Oregon Water Resources Department (OWRD) Well Report Mapping tool. Research of well logs filed with the OWRD revealed no drinking water supply wells within 1000 feet of the Site. Therefore, no copies of well logs are included.

Point Source inspected adjoining properties during the investigation and observed water meters that indicate connection to the municipal drinking water supply for all buildings located on adjoining properties.

### **Receptors, Pathways, and Human Health and Ecological Risk Assessments**

Potential receptors are those individuals who might be likely exposed to the COPCs under current and reasonably likely future land-use conditions. Current land use at the site and surrounding areas is zoned CM3 and R2.5 which allow for mixed-use commercial and residential uses. Any further future development for these properties is expected to be for commercial, retail, and residential purposes based on the zoning. Current and potential human receptors that have been identified in the risk-based screening include the following:

- Adults in current and future occupational scenario; and,
- Adults and children in current and future urban residential scenario; and,
- Adults in the future construction/excavation worker scenario.

A summary of COPCs that exceed RBCs the applicable exposure pathways for the Site include GROs, vinyl chloride, chloroform, benzene, trichloroethene, ethylbenzene and naphthalene. Analytical results were compared to ODEQ RBCs (May 2018) for the applicable exposure pathways.

<b>CONTAMINANTS OF POTENTIAL CONCERN (COPCs)</b>			
<b>COPC</b>	<b>Medium</b>	<b>Pathway</b>	<b>Receptor</b>
TPH-Gx	Soil	Soil Ingestion, Dermal Contact, Inhalation	Current Urban Residential receptors
		Volatilization to Outdoor Air	Current Urban Residential receptors
		Vapor Intrusion into Buildings	Current Urban Residential receptors
		Leaching to Groundwater	Current Urban Residential receptors
	Soil-gas	Vapor Intrusion into Buildings	Current Occupational and Urban Residential receptors
TPH-Dx	Soil	Soil Ingestion, Dermal Contact, Inhalation	Future Construction and Excavation Worker Receptors
Benzene	Soil-gas	Vapor Intrusion into Buildings	Current Urban Residential receptors
Ethylbenzene	Soil-gas	Vapor Intrusion into Buildings	Current Urban Residential receptors
Trichloroethene	Soil-gas	Vapor Intrusion into Buildings	Current Urban Residential receptors
Vinyl Chloride	Soil-gas	Vapor Intrusion into Buildings	Current Urban Residential receptors
Chloroform	Soil-gas	Vapor Intrusion into Buildings	Current Urban Residential receptors
Naphthalene	Soil-gas	Vapor Intrusion into Buildings	Current Occupational and Urban Residential receptors

While contaminant concentrations for GROs, vinyl chloride, chloroform, benzene, trichloroethene, ethylbenzene and naphthalene exceed applicable urban residential RBCs, contaminant concentrations exceeding these RBCs do not present a significant risk to current and reasonably likely future receptors at the Site due to the depth of impacted soils in relation to applicable receptors and the installation of engineering controls such as the 40-mil thick liner of Absolute Barrier® Y40BAC sub-slab vapor barrier and passive vapor mitigation system.

### *Soil*

COPCs detected in soil exceed the following RBCs.

- TPH-Gx in soil concentrations exceed the Urban Residential RBC<sub>si</sub> for Vapor Intrusion into Buildings.

**This pathway is considered incomplete as this compound was collected at a depth of 32 feet bgs and is not likely to be disturbed during any normal construction or excavation activities. However, if future development of the Site results in disturbance of the impacted soil plume, it is recommended that the work be overseen by a qualified environmental contractor to ensure that conditions are protective of worker safety, and that impacted soils are properly managed.**

- TPH-Dx in soil concentrations exceed the Urban Residential and Construction Worker RBC<sub>ss</sub> for Soil Ingestion, Dermal Contact, and Inhalation.

**This pathway is considered potentially complete. If future development of the Site results in disturbance of the impacted soil plume, it is recommended that the work be overseen by a qualified environmental contractor to ensure that conditions are protective of worker safety, and that impacted soils are properly managed.**

### *Soil Gas*

COPCs detected in soil gas exceed the following RBCs.

- GRO in soil gas concentrations exceed Urban Residential RBC<sub>si</sub> for Vapor Intrusion into Buildings.

**The vapor intrusion pathway is considered potentially complete as this compound was detected in soil gas samples collected at 42.0 feet bgs. However, three rounds of vapor samples collected from the passive vapor mitigation system and sub-slab monitoring points did not detect any COPC exceeding RBC<sub>si</sub> for Vapor Intrusion into Buildings. Any future development will require additional vapor testing and may require additional institutional or engineering controls to ensure urban residential receptors are not exposed to harmful vapors.**

- Benzene, Ethylbenzene, Trichloroethene, Vinyl Chloride, and Chloroform in soil gas concentrations exceed Urban Residential RBC<sub>si</sub> for Vapor Intrusion into Buildings.

**The vapor intrusion pathway is considered potentially complete as these compounds were detected in soil gas samples collected at 30.0 feet bgs. However, three rounds of vapor samples collected from the passive vapor mitigation system and sub-slab monitoring points did not detect any COPC exceeding RBC<sub>si</sub> for Vapor Intrusion into Buildings. Any future development will require additional vapor testing and may require additional institutional or engineering controls to ensure urban residential receptors are not exposed to harmful vapors.**

- Naphthalene in soil gas concentrations exceed Occupational RBC<sub>si</sub> for Vapor Intrusion into Buildings.

The vapor intrusion pathway is considered potentially complete as this compound was detected in soil gas samples collected at 42.0 feet bgs. However, three rounds of vapor samples collected from the passive vapor mitigation system and sub-slab monitoring points did not detect any COPC exceeding  $RBC_{si}$  for Vapor Intrusion into Buildings. Any future development will require additional vapor testing and may require additional institutional or engineering controls to ensure urban residential receptors are not exposed to harmful vapors.

### ***Ecological Risk Assessments***

Ecological risk was assessed according to guidance outlined in “Conducting Ecological Risk Assessments” (ODEQ, September 2020). A Basic Site Information Checklist with supporting documentation is included as **Appendix H**. An aerial map is included as **Figure 8**.

No ecological zones at risk of impact from the Site release were identified and no significant on-site exposure pathways have been identified for ecological receptors.

## **CONSTRUCTION OF ENGINEERING CONTROLS**

### ***SUB-SLAB VAPOR BARRIER AND VENTILATION SYSTEM***

The passive vapor mitigation system includes a sub-slab vapor barrier that incorporates a passive ventilation system (that can be upgraded to an active system, if necessary) beneath the barrier layer, within the aggregate located beneath the floor slab. The passive ventilation system operates continuously. The sub-slab system is designed to mitigate potential vapor risks, including VOCs originating from historically impacted soil.

Installation and construction of the vapor mitigation system designed by PBS began in June 2019 and the as-built design of the system was constructed in general accordance with the pre-construction schematic included in **Appendix F**. One 8-inch lift of highly permeable coarse aggregate was installed above proof-rolled ground. Trench lines were dug so that at least 8 inches of crushed stone was placed below all sub-slab conveyance piping and was covered with a minimum of 2 inches of crushed stone to prevent slab cracking. Perforated 4-inch Schedule 40 PVC conveyance piping was installed within the perimeter of the building as shown in **Figure 7**. Solid 4-inch Schedule 40 PVC conveyance pipe was plumbed from the system toward the center of the building where the elevator shaft was planned to be constructed, so as to run the stub up pipe to the roof through the elevator shaft. This design decision was a deviation from the pre-construction schematic included in **Appendix F** but was approved by ODEQ prior to installation as a suitable alternative. ODEQ provided comments on the PBS pre-construction design document on January 9, 2019 and PBS responded with the revisions on February 2, 2019 (provided via email to Rob Hood, Jeff Schatz and Sarah Greenfield).

The sub-slab vapor barrier consists of a 40-mil thick liner of Absolute Barrier® Y40BAC manufactured by Raven Industries. Absolute Barrier® is a seven-layer co-extruded geomembrane consisting of flexible, linear low-density polyethylene (LLDPE) with an inner layer of chemically resistant EVOH barrier resin designed specifically for protection from radon, methane, and VOCs.

Point Source observed the installation of the Absolute 40 mil Barrier. Point Source, with a representative from Raven Industries, confirmed the proper installation to manufacturer recommendations. On June 7, 2019, Nathan Williams, Professional Engineer (PE) with PBS performed smoke testing to detect any tears or holes in the barrier. No impairments to the barrier were noted during the smoke test. A copy of a memorandum prepared by PBS on the smoke testing results is included as **Appendix E**.

Later during the construction of the building, a sampling port was installed at the stub-up location outside the elevator shaft in an access port at the level of the sub-grade parking garage. The sampling port was installed using corrosion-resistant, lead-free brass fittings, sealed using polytetrafluorethylene tape. An expansion port was installed at the stub-up location above the sampling port using 4-inch solid Schedule 40 PVC pipe. The riser run to the roof from the expansion port also consists of 4-inch diameter Schedule 40 PVC pipe and extends above the building roof in such a way that no opening, window, or air intake is within ten feet of the riser outlet. The sampling port is to assess the sub-barrier vapor conditions and confirm that COPCs are being redirected via preferential route by the passive ventilation system.

### ***SUB-SLAB MONITORING POINTS***

Two sub-slab monitoring probes were installed in the sub-grade parking level floor of the site building in January 2021 to evaluate sub-slab vapor conditions above the barrier layer. These sub-slab monitoring probes were installed in general accordance with PBS design specifications and ODEQ guidance and are intended to facilitate routine monitoring for gasoline-range hydrocarbons and VOCs. Each sub-slab monitoring probe consists of a stainless-steel Vapor Pin® Sampling Device installed in the parking garage concrete slab floor over the 40-mil vapor barrier and covered by a Vapor Pin® Secure Cover placed in the parking garage floor. These monitoring points are to assess the sub-slab vapor conditions and any potential vapor intrusion through the 40-mil vapor barrier and represent potential indoor air conditions.

The probes are fitted with a threaded sample port to facilitate sampling and measurements. Each monitoring point assembly is sealed to inhibit ambient air intrusion into the intake zone. Sub-slab monitoring probe details are shown in **Figure 6**.

A baseline monitoring event of the sub-slab probe locations was completed by Point Source at the time of installation. The baseline monitoring event was sampled using laboratory-provided sorbent tubes analyzed via Method TO-17. After the submittal of the OMMP to ODEQ, ODEQ requested that the analytical method be changed to Method TO-15 for all subsequent performance monitoring events, stating that Method TO-15 is a more appropriate method for evaluating vapor intrusion. For this reason, the analytical method was changed to Method TO-15 for all subsequent performance monitoring events, and all samples collected during the performance monitoring events used laboratory-provided summa canisters. A leak test was performed on each probe location during the installation and each monitoring event per the Vapor Pin® standard operating procedure. Per ODEQ requirements, three rounds of soil vapor samples were collected at six month intervals (June 2021, December 2021, and June 2022) from the two sub-slab monitoring probe and the sampling port on the sub-slab ventilation system riser.

A copy of an Operations, Monitoring, and Maintenance Plan (OMMP) for the Site prepared by Point Source is included as **Appendix G**.

### **CONCLUSIONS**

The remedial actions and measures taken for the management and removal of impacted soils at the Site during redevelopment activities has been completed in general accordance with the scope of work originally discussed in a memorandum to Mr. Robert Hood of ODEQ on April 17, 2018, and revised via email correspondence. A total of approximately 441.7 tons of impacted soil was transported to the Waste Management Hillsboro Subtitle D Landfill for disposal during the mass excavation and installation of soldier piles.

As discussed in this report, PCS remains in place at depths between 15 to 50 bgs above Urban Residential RBC<sub>si</sub> for Vapor Intrusion into Buildings. The locations of remaining PCS at the site are discussed as follows:

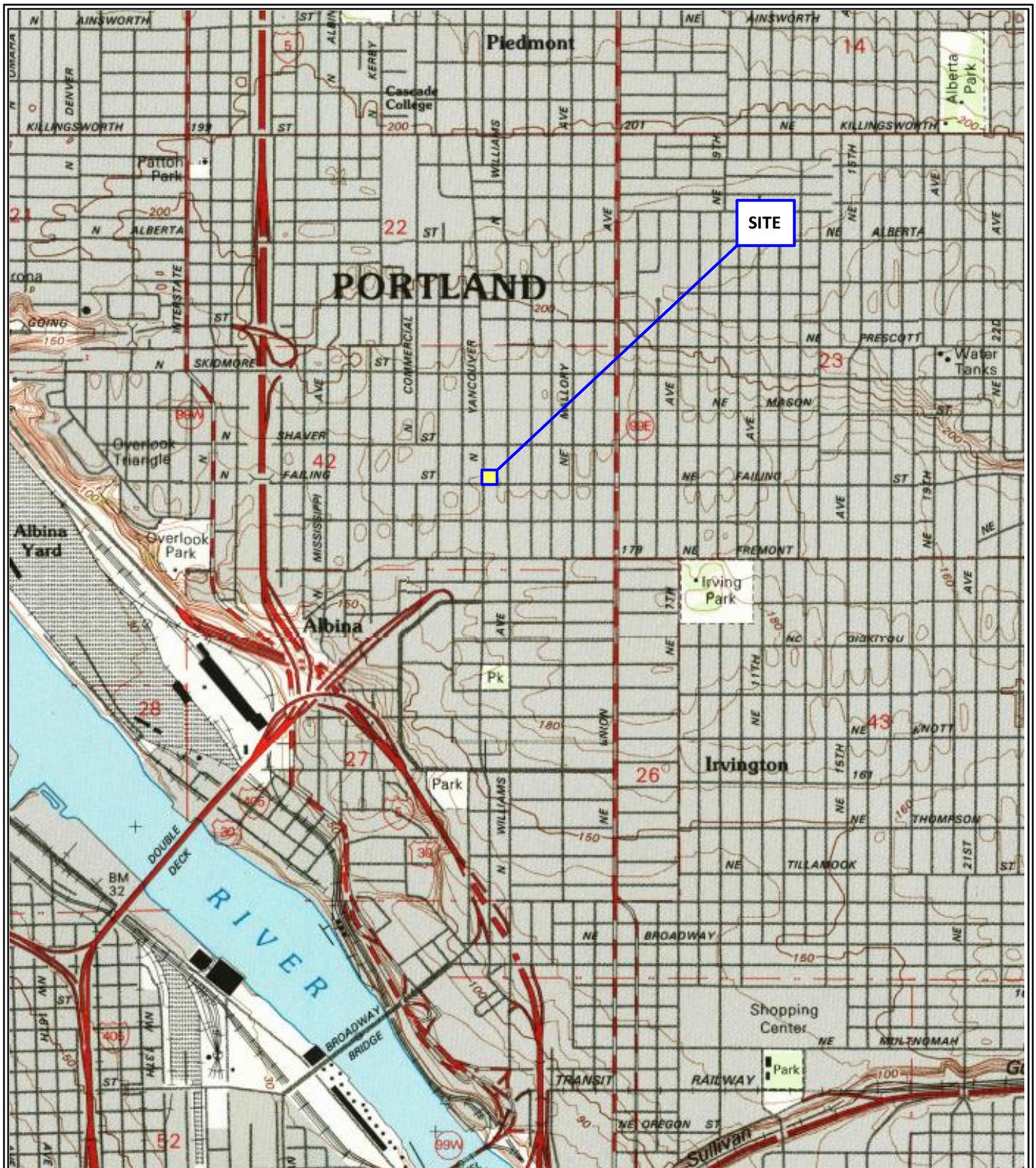
- An approximate 78.5 square foot lens of TPH-Dx observed by visual observations and confirmed by soil sample SG1-S1-15 collected from the floor of the mass excavation at 15 feet bgs in close proximity to antecedent soil boring SB11/SB11B. Vertical delineation was not possible, and for access reasons could not be determined in the field during the excavation activities. Therefore, a conservative assumption that contamination terminates vertically between 50 to 60 feet bgs is assumed based on nearby soil boring SB11 and SB11B. Based on this assumption, approximately 167 cubic yards of contaminated soil lie beneath the Site in the area confirmed by SG1-S1-15 at a depth of 15 to 60 feet bgs.
- An approximate 369 square foot lens observed using visual and olfactory observations during pile driving activities in the southwest corner of the Site, extending from 20 feet bgs to the base of the piles at 35 feet bgs. The size of the plume at the base of the piles is only known by field observations and results from the August 2017 Subsurface Investigation. Therefore, a conservative assumption that contamination terminates vertically between 50 to 60 feet bgs is assumed and it is estimated that 615 cubic yards of PCS extends beneath the Site near the southern property line at a depth of 20 to 50 feet bgs.

A total of approximately 782 cubic yards of PCS remain in place at varying depths beneath the passive vapor mitigation system and vapor barrier. The remaining contamination is confined by the area of influence created by the vapor mitigation system using passive ventilation, which allows for off gassing and gradual attenuation of COPCs without applicable receptor exposure. The only exposure pathways that are currently and/or foreseeably open are the Vapor Intrusion into Buildings for urban residential and occupational receptors, which do not present a significant risk at the Site due to the depth of impacted soils in relation to applicable receptors and the installation of engineering controls.

Stable conditions at the Site are confirmed by three rounds of performance monitoring (June 2021 event, December 2021 event, June 2022 event) of COPCs below all applicable RBCs. Furthermore, the presence of site-related VOCs in sub-slab vapor near, at, or greater than respective RBCs does not necessarily correlate to indoor air risks. This is because the passive ventilation system operates continuously, thereby providing a preferential route for VOCs to be removed from the sub-slab zone and the impermeable membrane is designed to inhibit migration of contaminants into the building spaces.

If you have any questions regarding the information contained in this Construction Completion Report, please do not hesitate to call Gil Cobb or Jeff Jackman at 503.236.5885. The point of contact for the current property owner is Pui Leung, Principal of Vibrant Cities, LLC, who can be reached by phone at 425-793-9088, or by email at [pleung@vibrantcities.com](mailto:pleung@vibrantcities.com).

## FIGURES



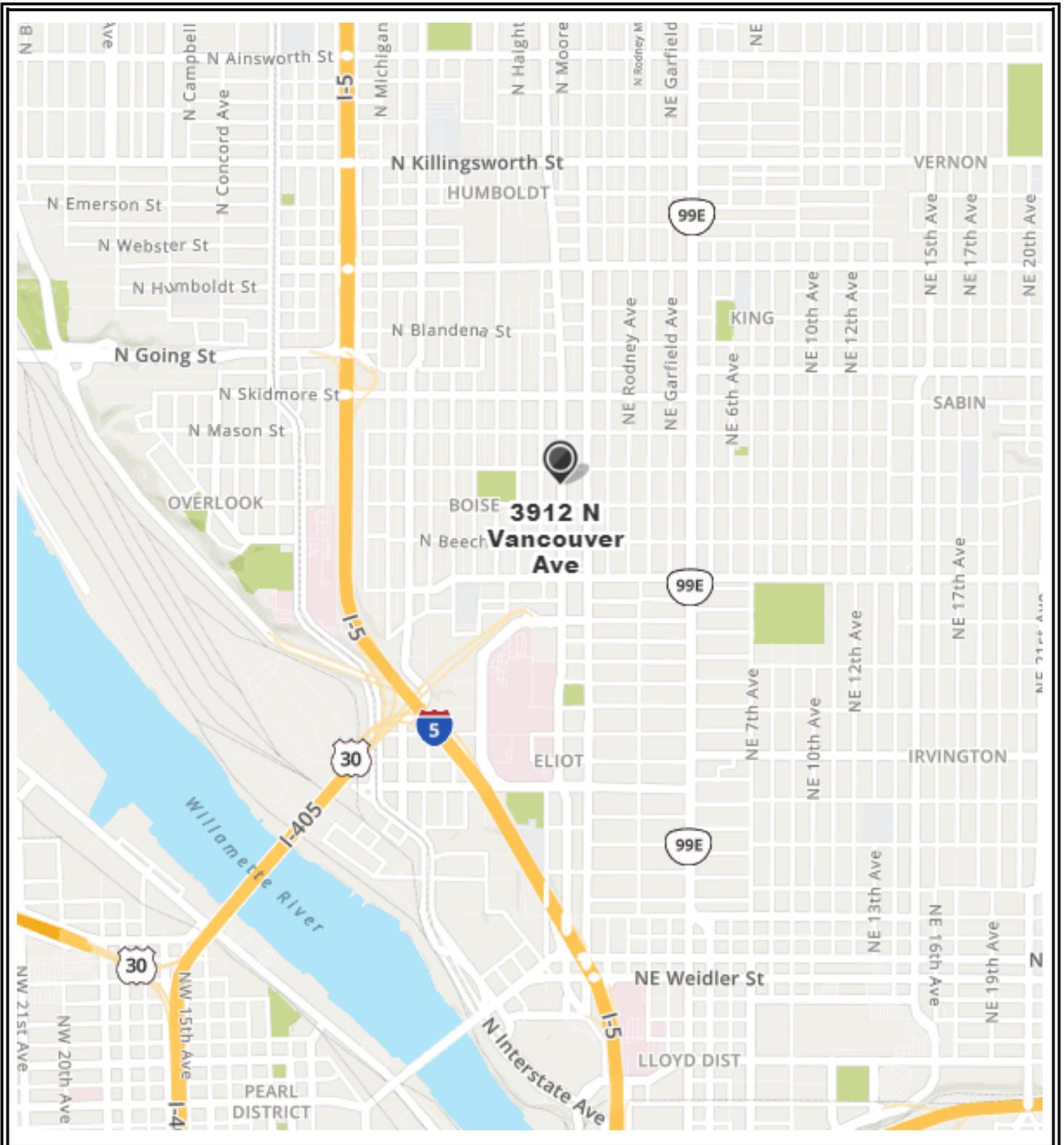
**FIGURE 2: TOPOGRAPHIC MAP**

Source: USGS 7.5 Minute Topo Map  
Portland OR, 1977



**Site Name: ECSI Facility #6219**  
**3912 N Vancouver Avenue**  
**Portland, Oregon 97227**

**Project Number: OR170712-3**



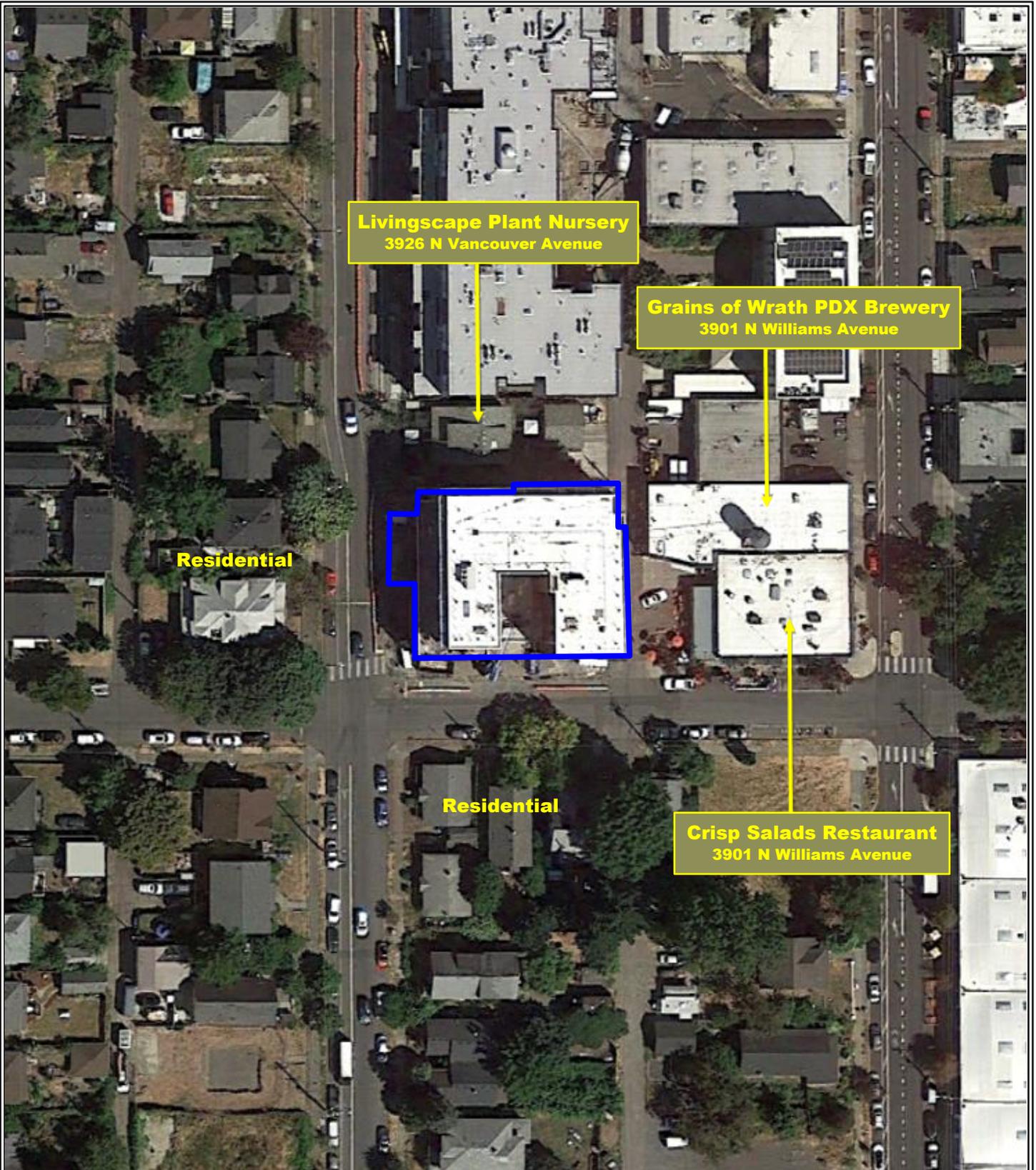
**FIGURE 1: SITE LOCATION MAP**

Map from MapQuest



**Site Name: ECSI Facility #6219**  
**3912 N Vancouver Avenue**  
**Portland, Oregon 97227**

**Project Number: OR170712-3**



**FIGURE 3: SITE PLAN**

Image from  
Google Earth (2020)



**Site Name: ECSI Facility #6219**  
**3912 N Vancouver Avenue**  
**Portland, Oregon 97227**

**Project Number: OR170712-3**



**FIGURE 4: FORMER UST LOCATIONS**

Image from  
Google Earth (2018)



**Notes:**

- Soil Sample results in mg/Kg
- \* Represents soils that have been removed.
- Background Image represents pre-site development.



Former USTs 2014  
LUST #26-14-1732



Former USTs 2019



Building Footprint  
(Excavation Boundary)



Soil Sample Location  
(Contaminated)



Soil Sample Location  
(No Contamination)



Former Hoist 2014  
LUST #26-14-1732

**Scale in Feet (Approximate)**



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**Site Name: ECSI Facility #6219**  
**3912 N Vancouver Avenue**  
**Portland, Oregon 97227**

**Project Number: OR170712-3**



**FIGURE 5: MASS EXCAVATION & PCS BOUNDARIES**

Image from Google Earth (2019)



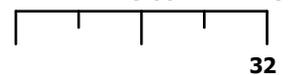
**Notes:**

- Soil Sample results in mg/Kg
- \* Represents soils that have been removed.
- Background Image represents site development & construction activities.
- Final base grade for mass excavation is 15 – 21 feet bgs

- - - - - Approx. Removed PCS
- . - . - . Approx. Remaining PCS
- Building Footprint (Excavation Boundary)

- Soil Sample Location (Contaminated)
- Soil Sample Location (No Contamination)
- ⊥ Soldier Piles

Scale in Feet (Approximate)

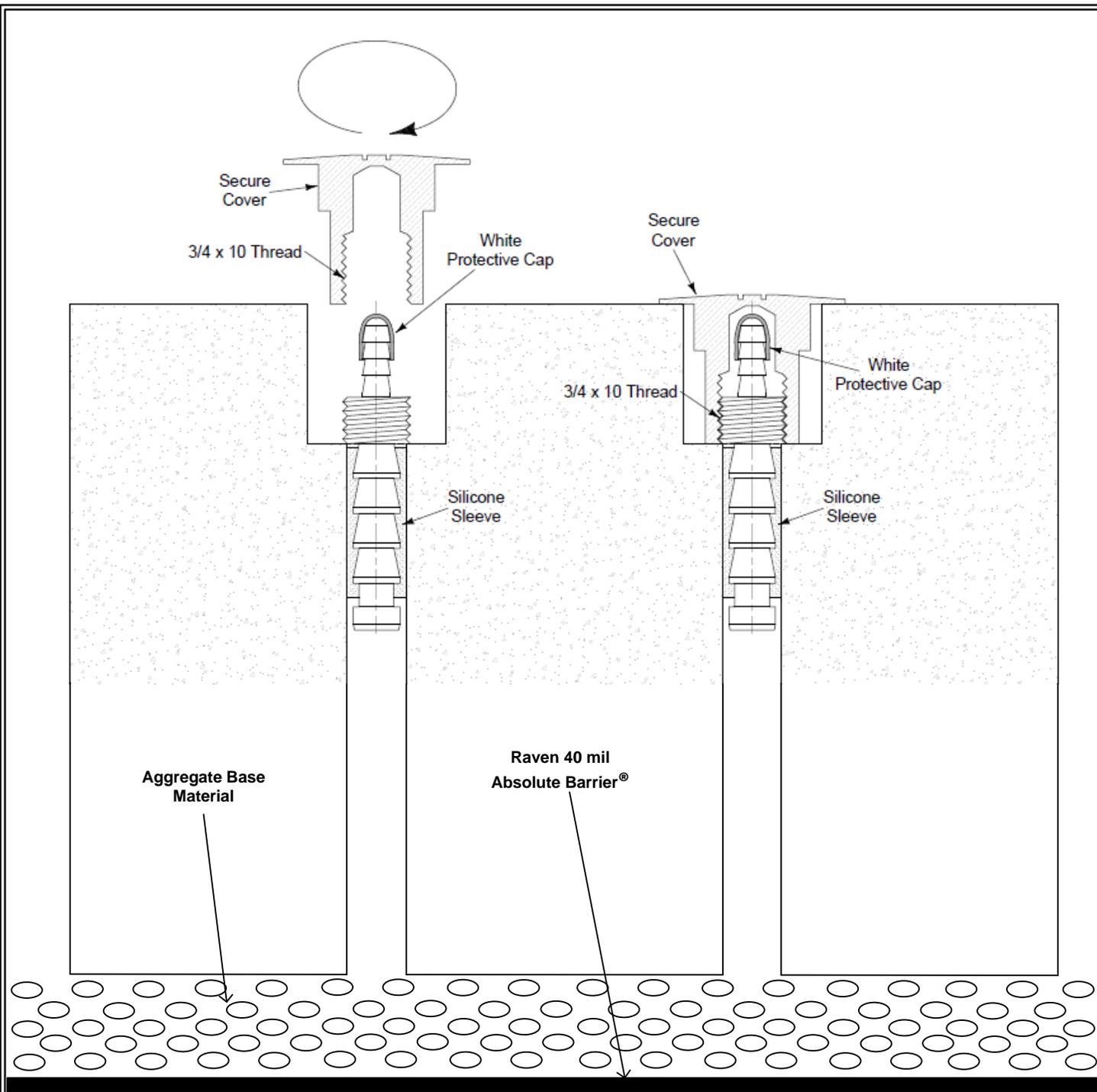


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**Site Name: ECSI Facility #6219**  
**3912 N Vancouver Avenue**  
**Portland, Oregon 97227**

**Project Number: OR170712-3**



**FIGURE 6: SUB-SLAB MONITORING PROBE DETAIL**

Image from PBS Engineering & Environmental Inc

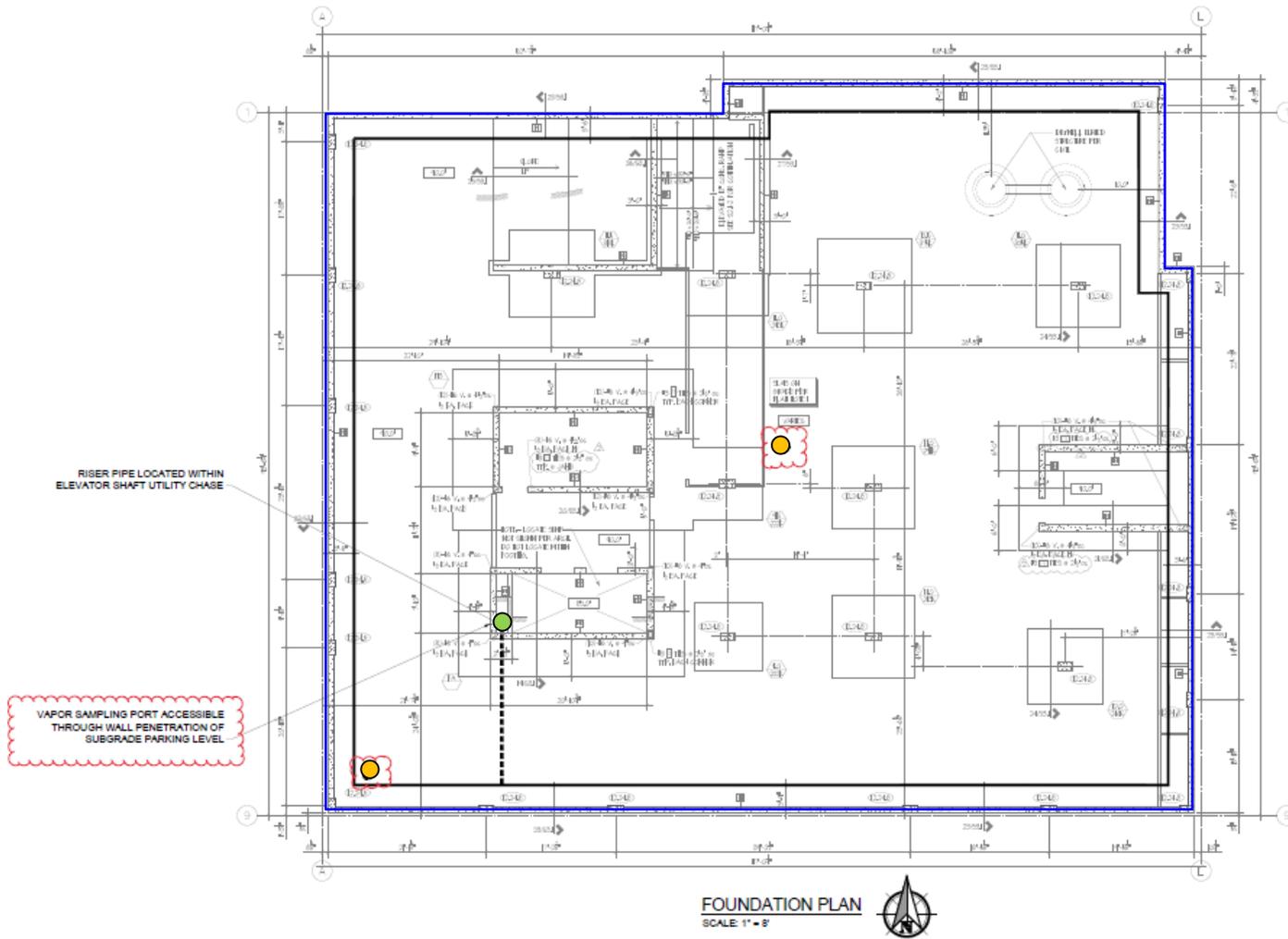


Stainless Steel Vapor Pin® and Secure Cover



**Site Name: ECSI Facility #6219**  
**3912 N Vancouver Avenue**  
**Portland, Oregon 97227**

**Project Number: OR170712-3**



**FIGURE 7: PASSIVE VENTILATION SYSTEM**

Plans from PBS Engineering & Environmental Inc (2020)



*Notes:*

-  4 inch Perforated Schedule 40 PVC
-  Sub-slab Vapor Point Locations
-  Building Foundation Boundary
-  Stub-up Sample Location



**Site Name: Brio Lofts – ECSI Facility #6219**  
**3912 N Vancouver Avenue**  
**Portland, Oregon 97227**

**Project Number: OR170712-3**

## **TABLES**

TABLE 1 – DECEMBER 2019 UST SOIL SAMPLE RESULTS

ANALYTE	RBCsi Residential	RBCsi Urban Residential	RBCsi Occupational	NWTE-S1*	NETE-S1*	SWTE-S1*	SETE-S1*
SOIL (MG/KG) – EPA METHODS NWTPH-GX, NWTPH-DX							
Diesel	-	-	-	<25	19,900	<25	<25
Heavy Oil	-	-	-	<100	<100	<100	<100
GRO	94	94	-	1,980	361	<100	1,630

Notes:

- Concentrations are only presented for regulated compounds. Various compounds were detected in these samples without corresponding RBCs for the relevant exposure scenarios.
- - = No RBC value, due to the chemical’s nonvolatility, the RBC exceeding three-phase equilibrium partitioning, or the RBC exceeding 1,000,000, or otherwise not posing a risk in this receptor scenario.
- \* Represents soils that have been removed

Soil exceeding RBCsi – Residential Receptors

Soil exceeding RBCsi – Urban Residential Receptors

Soil exceeding RBCsi – Occupational Receptors

TABLE 2 – FEBRUARY 2019 CONFIRMATION SOIL SAMPLE RESULTS

ANALYTE	RBCsi Residential	RBCsi Urban Residential	RBCsi Occupational	SG1-S1	SG2-S1	SG3-S1*
SOIL (MG/KG) – EPA METHODS NWTPH-DX, 8260 (VOCS)						
Diesel	-	-	-	7,210	<25	<25
Heavy Oil	-	-	-	<100	<100	<100
Naphthalene	6.4	15	83	1.029	<0.2	<0.2
124-TMB	140	140	-	0.304	<0.2	<0.2

Notes:

- Concentrations are only presented for regulated compounds. Various compounds were detected in these samples without corresponding RBCs for the relevant exposure scenarios.
- - = No RBC value, due to the chemical’s nonvolatility, the RBC exceeding three-phase equilibrium partitioning, or the RBC exceeding 1,000,000, or otherwise not posing a risk in this receptor scenario.
- \* Represents soils that have been removed

Soil exceeding RBCsi – Residential Receptors
Soil exceeding RBCsi – Urban Residential Receptors
Soil exceeding RBCsi – Occupational Receptors

TABLE 2A – FEBRUARY 2019 CONFIRMATION SOIL SAMPLE RESULTS

ANALYTE	RBCss Residential	RBCss Urban Residential	RBCss Occupational	RBCss Const. & Exc. Worker	SG1-S1	SG2-S1	SG3-S1*
SOIL (MG/KG) – EPA METHODS NWTPH-DX, 8260 (VOCS)							
Diesel	1,200	2,500	20,000	4,600	7,210	<25	<25
Heavy Oil	1,200	2,500	20,000	4,600	<100	<100	<100
Naphthalene	5.3	25	23	580/16,000	1.029	<0.2	<0.2
124-TMB	430	860	6,900	2,900/81,000	0.304	<0.2	<0.2

Notes:

- Concentrations are only presented for regulated compounds. Various compounds were detected in these samples without corresponding RBCs for the relevant exposure scenarios.
- - = No RBC value, due to the chemical’s nonvolatility, the RBC exceeding three-phase equilibrium partitioning, or the RBC exceeding 1,000,000, or otherwise not posing a risk in this receptor scenario.
- \* Represents soils that have been removed

Soil exceeding RBCsi – Residential Receptors
Soil exceeding RBCsi – Urban Residential Receptors
Soil exceeding RBCsi – Occupational Receptors
Soil exceeding RBCsi – Construction & Excavation Workers Receptors

TABLE 3 – JUNE 2014 SUBSURFACE INVESTIGATION

ANALYTE	RBCsi Residential	RBCsi Urban Residential	RBCsi Occupational	SB1-S1	SB2-S1	SB3-S1	SB3-S2	SB4-S1	SB5-S1	SB5-S2	SB6-S1	SB7-S1	SB8-S1	SB9-S1	SB10-S1
SOIL (MG/KG) – EPA METHODS NWTPH-GX, NWTPH-DX, 8260 (VOCS)															
Diesel	-	-	-	<64	<61	<67	<65	<16	<b>17,000</b>	<61	<61	<62	<62	<62	<62
Heavy Oil	-	-	-	<130	<b>330</b>	<130	<130	<b>220</b>	<b>64,000</b>	<120	<120	<120	<120	<120	<120
GRO	94	94	-	<25	<24	<27	<26	<26	<b>3,900</b>	<25	<25	<25	<25	<25	<25
Benzene	0.16	0.38	2.1	<0.13	<0.12	<0.13	<0.13	<0.13	<0.61	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
Bromodichloromethane	0.041	0.096	0.53	<0.13	<0.12	<0.13	<0.13	<0.13	<0.61	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
Bromoform	8.2	19	110	<0.63	<0.61	<0.67	<0.63	<0.63	<3.0	<0.61	<0.61	<0.61	<0.63	<0.61	<0.63
Chlorobenzene	77	77	-	<0.13	<0.12	<0.13	<0.13	<0.13	<0.61	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
Chloroform	0.031	0.074	0.41	<0.13	<0.12	<0.13	<0.13	<0.13	<0.61	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
1,4-dichlorobenzene	0.99	2.3	13	<0.13	<0.12	<0.13	<0.13	<0.13	<0.61	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
1,1-dichloroethane	0.45	1.1	5.9	<0.13	<0.12	<0.13	<0.13	<0.13	<0.61	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
1,1-dichloroethene	54	54	680	<0.13	<0.12	<0.13	<0.13	<0.13	<0.61	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
Cis-1,2-dichloroethene	-	-	-	<0.13	<0.12	<0.13	<0.13	<0.13	<0.61	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
Trans-1,2-dichloroethene	-	-	-	<0.13	<0.12	<0.13	<0.13	<0.13	<0.61	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
Ethylbenzene	1.3	3.0	17	<0.13	<0.12	<0.13	<0.13	<0.13	<0.61	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
Hexachlorobutadiene	-	-	-	<0.50	<0.49	<0.54	<0.51	<0.51	<0.61	<0.49	<0.49	<0.49	<0.50	<0.49	<0.50
Isopropylbenzene	-	-	-	<0.25	<0.24	<0.25	<0.25	<0.25	<1.2	<0.24	<0.24	<0.24	<0.25	<0.24	<0.25
MTBE	8.5	20	110	<0.13	<0.2	<0.13	<0.13	<0.13	<0.61	<0.2	<0.2	<0.2	<0.13	<0.2	<0.13
Naphthalene	6.4	15	83	<0.25	<0.25	<0.27	<0.25	<0.25	<b>1.7</b>	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Styrene	-	-	-	<0.13	<0.12	<0.13	<0.13	<0.13	<0.61	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
Tetrachloroethylene	2.8	6.6	36	<0.13	<0.12	<0.13	<0.13	<0.13	<0.61	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
Toluene	-	-	-	<0.13	<0.12	<0.13	<0.13	<0.13	<0.61	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
1,1,1-trichloroethane	-	-	-	<0.13	<0.12	<0.13	<0.13	<0.13	<0.61	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
1,1,2-trichloroethane	0.32	0.38	4.2	<0.13	<0.12	<0.13	<0.13	<0.13	<0.61	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
Trichloroethene	0.12	0.26	2.3	<0.13	<0.12	<0.13	<0.13	<0.13	<0.61	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
124-TMB	140	140	-	<0.13	<0.12	<0.13	<0.13	<0.13	<b>2.4</b>	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
135-TMB	98	98	-	<0.13	<0.12	<0.13	<0.13	<0.13	<b>1.0</b>	<0.12	<0.12	<0.12	<0.13	<0.12	<0.13
Xylenes (total)	160	160	-	<0.38	<0.36	<0.40	<0.38	<0.38	<1.81	<0.36	<0.36	<0.36	<0.38	<0.36	<0.38

Notes:

- Concentrations are only presented for regulated compounds. Various compounds were detected in these samples without corresponding RBCs for the relevant exposure scenarios.

- - = No RBC value, due to the chemical's nonvolatility, the RBC exceeding three-phase equilibrium partitioning, or the RBC exceeding 1,000,000, or otherwise not posing a risk in this receptor scenario.

Soil exceeding RBCsi – Residential Receptors

Soil exceeding RBCsi – Urban Residential Receptors

Soil exceeding RBCsi – Occupational Receptors

TABLE 3 – JUNE 2014 SUBSURFACE INVESTIGATION

ANALYTE	RBCsi Residential	RBCsi Urban Residential	RBCsi Occupational	SB5-S1
SOIL (MG/KG) – METHODS 8270 (PAHS), 8082 (PCBS), 6020 (METALS)				
Acenaphthene	0.079	0.19	1	<0.41
Anthracene	-	-	-	<0.41
Benzo[a]anthracene	-	-	-	<2.0
Benzo[a]pyrene	-	-	-	<2.0
Benzo[b]fluoranthene	-	-	-	<2.0
Chrysene	-	-	-	2.4
Dibenz[a,h]anthracene	-	-	-	<2.0
Fluoranthene	-	-	-	<0.41
Fluorene	-	-	-	<0.41
Indeno[1,2,3-cd]pyrene	-	-	-	<2.0
Naphthalene	6.4	15	83	2.5
Pyrene	-	-	-	<2.0
PCB-1016	-	-	-	<0.61
PCB-1221	-	-	-	<1.2
PCB-1232	-	-	-	<0.61
PCB-1242	-	-	-	<0.61
PCB-1248	-	-	-	<0.61
PCB-1254	-	-	-	<0.61
PCB-1260	-	-	-	<3.1
Arsenic	-	-	-	6.7
Barium	-	-	-	190
Chromium	-	-	-	26
Lead	-	-	-	12
Silver	-	-	-	<0.61
Selenium	-	-	-	<0.61
Cadmium	-	-	-	<0.61
Mercury	-	-	-	<0.11

Notes:

- Concentrations are only presented for regulated compounds. Various compounds were detected in these samples without corresponding RBCs for the relevant exposure scenarios.
- - = No RBC value, due to the chemical's nonvolatility, the RBC exceeding three-phase equilibrium partitioning, or the RBC exceeding 1,000,000, or otherwise not posing a risk in this receptor scenario.

Soil exceeding RBCsi – Residential Receptors
Soil exceeding RBCsi – Urban Residential Receptors
Soil exceeding RBCsi – Occupational Receptors

TABLE 4 – FEBRUARY 2015 UST SOIL SAMPLE RESULTS

ANALYTE	RBCsi Residential	RBCsi Urban Residential	RBCsi Occupational	SB11	SB12	SB13	SB14	SB15	SB16	SB17	SB18	SB19
SOIL (MG/KG) – EPA METHODS NWTPH-GX, NWTPH-DX, 8260 (VOCS)												
Diesel	-	-	-	<62	<64	<63	<62	4,000	1,200	360	<25.0	<25.0
Heavy Oil	-	-	-	<120	<130	<130	<120	<320	<32	740	<100.0	<100.0
GRO	94	94	-	<25	<25	<25	<25	14,000	5,700	6.9	<20.0	<20.0
Benzene	0.16	0.38	2.1	NA	NA	NA	NA	<13	NA	NA	NA	<0.05
Bromodichloromethane	0.041	0.096	0.53	NA	NA	NA	NA	<13	NA	NA	NA	<0.05
Bromoform	8.2	19	110	NA	NA	NA	NA	<64	NA	NA	NA	<0.05
Chlorobenzene	77	77	-	NA	NA	NA	NA	<13	NA	NA	NA	<0.05
Chloroform	0.031	0.074	0.41	NA	NA	NA	NA	<13	NA	NA	NA	<0.05
1,2-dichlorobenzene	-	-	-	NA	NA	NA	NA	NA	NA	NA	NA	<0.05
1,4-dichlorobenzene	0.99	2.3	13	NA	NA	NA	NA	<13	NA	NA	NA	<0.05
1,1-dichloroethane	0.45	1.1	5.9	NA	NA	NA	NA	<13	NA	NA	NA	<0.05
1,1-dichloroethene	54	54	680	NA	NA	NA	NA	<13	NA	NA	NA	<0.05
Cis-1,2-dichloroethene	-	-	-	NA	NA	NA	NA	<13	NA	NA	NA	<0.05
Trans-1,2-dichloroethene	-	-	-	NA	NA	NA	NA	<13	NA	NA	NA	<0.05
Ethylbenzene	1.3	3.0	17	NA	NA	NA	NA	140	NA	NA	NA	<0.05
Hexachlorobutadiene	-	-	-	NA	NA	NA	NA	<51	NA	NA	NA	<0.05
Isopropylbenzene	-	-	-	NA	NA	NA	NA	29	NA	NA	NA	<0.05
MTBE	8.5	20	110	NA	NA	NA	NA	<13	NA	NA	NA	<0.05
Naphthalene	6.4	15	83	NA	NA	NA	NA	69	NA	NA	NA	80.0
Styrene	-	-	-	NA	NA	NA	NA	<13	NA	NA	NA	<0.05
Tetrachloroethylene	2.8	6.6	36	NA	NA	NA	NA	<13	NA	NA	NA	<0.05
Toluene	-	-	-	NA	NA	NA	NA	<13	NA	NA	NA	<0.05
1,1,1-trichloroethane	-	-	-	NA	NA	NA	NA	<13	NA	NA	NA	<0.05
1,1,2-trichloroethane	0.32	0.38	4.2	NA	NA	NA	NA	<13	NA	NA	NA	<0.05
Trichloroethene	0.12	0.26	2.3	NA	NA	NA	NA	<13	NA	NA	NA	<0.05
124-TMB	140	140	-	NA	NA	NA	NA	940	NA	NA	NA	178
135-TMB	98	98	-	NA	NA	NA	NA	280	NA	NA	NA	159
Xylenes (total)	160	160	-	NA	NA	NA	NA	920	NA	NA	NA	243

Notes:

- Concentrations are only presented for regulated compounds. Various compounds were detected in these samples without corresponding RBCs for the relevant exposure scenarios.
- - = No RBC value, due to the chemical's nonvolatility, the RBC exceeding three-phase equilibrium partitioning, or the RBC exceeding 1,000,000, or otherwise not posing a risk in this receptor scenario.
- NA = Not Analyzed

Soil exceeding RBCsi – Residential Receptors
Soil exceeding RBCsi – Urban Residential Receptors
Soil exceeding RBCsi – Occupational Receptors

**TABLE 5 – JULY 2017 SUBSURFACE INVESTIGATION**

ANALYTE	RBCsi Residential	RBCsi Urban Residential	RBCsi Occupational	SB11B-S1-11	SB11B-S2-32	SB11B-S1-40	SB11B-S2-50	SB11B-S3-60	SB14-S1-12	SB16-S1-20	SB16-S2-30	SB18-S1-20	SB19-S1-30
<b>SOIL (MG/KG) – EPA METHODS NWTPH-GX, NWTPH-DX</b>													
<b>Diesel</b>	-	-	-	<b>19,600</b>	<b>6,720</b>	<b>4,680</b>	<b>837</b>	<25	<50	<25	<b>1,270</b>	<25	<b>564</b>
<b>Heavy Oil</b>	-	-	-	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
<b>GRO</b>	94	94	-	<b>24,300</b>	<b>6,710</b>	<b>1,690</b>	<b>148</b>	<20	<20	<20	<b>1,290</b>	<20	<b>222</b>

*Notes:*

- Concentrations are only presented for regulated compounds. Various compounds were detected in these samples without corresponding RBCs for the relevant exposure scenarios.
- - = No RBC value, due to the chemical’s nonvolatility, the RBC exceeding three-phase equilibrium partitioning, or the RBC exceeding 1,000,000, or otherwise not posing a risk in this receptor scenario.

Soil exceeding RBCsi – Residential Receptors  
 Soil exceeding RBCsi – Urban Residential Receptors  
 Soil exceeding RBCsi – Occupational Receptors

TABLE 5 – JULY 2017 SUBSURFACE INVESTIGATION

ANALYTE	RBCsi Residential	RBCsi Urban Residential	RBCsi Occupational	SB11B-S1-11	SB11B-S1-40	SB19-S1-30
SOIL (MG/KG) – METHODS 8260 (VOCS), 8270 (PAHS), 8082 (PCBS), 6020 (METALS)						
Naphthalene	6.4	15	83	62.4	1.9	0.2
Acenaphthene	0.079	0.19	1	5.3	0.4	0.2
Fluorene	-	-	-	7.1	1.2	0.4
Anthracene	-	-	-	0.2	0.1	<0.1
Fluoranthene	-	-	-	<0.1	<0.1	<0.1
Pyrene	-	-	-	<0.1	<0.1	<0.1
Benzo(a)anthracene	-	-	-	<0.1	<0.1	<0.1
Chrysene	-	-	-	<0.1	<0.1	<0.1
Benzo(b,k)fluoranthene	-	-	-	<0.2	<0.2	<0.2
Benzo(a)pyrene	-	-	-	<0.1	<0.1	<0.1
Indeno(1,2,3-cd)pyrene	-	-	-	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	-	-	-	<0.1	<0.1	<0.1
Benzene	0.16	0.38	2.1	<0.2	<0.102	<0.102
Bromodichloromethane	0.041	0.096	0.53	<0.2	<0.102	<0.102
Bromoform	8.2	19	110	<0.2	<0.102	<0.102
Chlorobenzene	77	77	-	<0.2	<0.102	<0.102
Chloroform	0.031	0.074	0.41	<0.2	<0.102	<0.102
1,2-dichlorobenzene	-	-	-	<0.2	<0.102	<0.102
1,4-dichlorobenzene	0.99	2.3	13	<0.2	<0.102	<0.102
1,1-dichloroethane	0.45	1.1	5.9	<0.2	<0.102	<0.102
1,1-dichloroethene	54	54	680	<0.2	<0.102	<0.102
Cis-1,2-dichloroethene	-	-	-	<0.2	<0.102	<0.102
Trans-1,2-dichloroethene	-	-	-	<0.2	<0.102	<0.102
Ethylbenzene	1.3	3.0	17	0.924	0.207	<0.102
Hexachlorobutadiene	-	-	-	<0.2	<0.102	<0.102
Isopropylbenzene	-	-	-	1.36	0.336	<0.102
MTBE	8.5	20	110	<0.2	<0.102	<0.102
Naphthalene	6.4	15	83	157	6.358	0.560
Styrene	-	-	-	<0.2	<0.102	<0.102

TABLE 5 – JULY 2017 SUBSURFACE INVESTIGATION

ANALYTE	RBCsi Residential	RBCsi Urban Residential	RBCsi Occupational	SB11B-S1-11	SB11B-S1-40	SB19-S1-30
SOIL (MG/KG) – METHODS 8260 (VOCS), 8270 (PAHS), 8082 (PCBS), 6020 (METALS)						
Tetrachloroethylene	2.8	6.6	36	<0.2	<0.102	<0.102
Toluene	-	-	-	<0.2	<0.102	<0.102
1,1,1-trichloroethane	-	-	-	<0.2	<0.102	<0.102
1,1,2-trichloroethane	0.32	0.38	4.2	<0.2	<0.102	<0.102
Trichloroethene	0.12	0.26	2.3	<0.2	<0.102	<0.102
124-TMB	140	140	-	8.96	0.332	<0.102
135-TMB	98	98	-	7.84	1.127	<0.102
Xylenes (total)	160	160	-	1.81	0.555	<0.203
Lead	-	-	-	<12	3.27	4.66
Arsenic	-	-	-	NA	1.31	1.75
Barium	-	-	-	NA	83.0	115
Cadmium	-	-	-	NA	0.301	0.347
Chromium	-	-	-	NA	8.38	10.5
Mercury	-	-	-	NA	<0.0925	<0.0991
Selenium	-	-	-	NA	<1.16	<1.24
Silver	-	-	-	NA	<0.231	<0.248
Aroclor 1016	-	-	-	NA	<0.0109	<0.0115
Aroclor 1221	-	-	-	NA	<0.0109	<0.0115
Aroclor 1232	-	-	-	NA	<0.0109	<0.0115
Aroclor 1242	-	-	-	NA	<0.0109	<0.0115
Aroclor 1248	-	-	-	NA	<0.0109	<0.0115
Aroclor 1254	-	-	-	NA	<0.0109	<0.0115
Aroclor 1260	-	-	-	NA	<0.0109	<0.0115

Notes:

- Concentrations are only presented for regulated compounds. Various compounds were detected in these samples without corresponding RBCs for the relevant exposure scenarios.
- - = No RBC value, due to the chemical's nonvolatility, the RBC exceeding three-phase equilibrium partitioning, or the RBC exceeding 1,000,000, or otherwise not posing a risk in this receptor scenario.

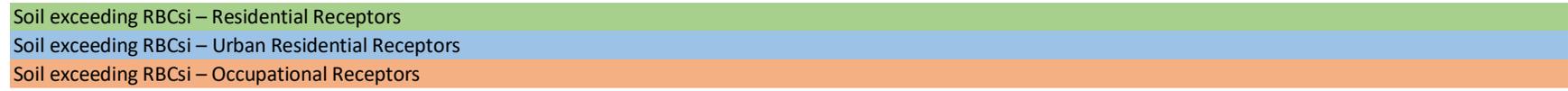


TABLE 6 – JUNE 2018 SOIL GAS INVESTIGATION

ANALYTE	RBCsg Residential	RBCsg Urban Residential	RBCsg Occupational	SV1	SV2	SV3	SV4	SV5
SOIL GAS (UG/M3) – METHOD TO-15 (VOCS, GRO)								
1,1-Dichloroethane	350	830	7,700	580	1.6	<1.3	<1.3	<10
1,1-Dichloroethene	42,000	42,000	880,000	2,600	7.9	2.5	<1.3	<9.9
1,1,1-Trichloroethane	1,000,000	1,000,000	22,000,000	6,300	13	<1.8	<1.8	<14
1,1,2-Trichloroethane	35	42	770	<4.1	<0.18	<0.18	<0.18	<1.4
1,2-Dichlorobenzene	42,000	42,000	880,000	<45	2.2	<2	<2	<15
1,2,4-TMB	13,000	13,000	260,000	310	180	160	73	660
1,3,5-TMB	13,000	13,000	260,000	<180	84	63	35	520
1,4-Dichlorobenzene	51	120	1,100	<18	<0.79	<0.79	<0.79	<6
1,4-Dioxane	110	270	2,500	<27	<1.2	<1.2	<1.2	<9
Benzene	72	170	1,600	330	63	36	59	110
Bromoform	510	1,200	11,000	<160	<6.8	<6.8	<6.8	<52
Bromomethane	1,000	1,000	22,000	<120	<5.1	<5.1	<5.1	<39
Carbon tetrachloride	94	220	2,000	220	<2.1	<2.1	<2.1	<16
Chlorobenzene	10,000	10,000	220,000	<35	<1.5	<1.5	<1.5	<12
Chloroethane	2,100,000	2,100,000	44,000,000	<20	<0.87	<0.87	<0.87	<6.6
Chloroform	24	58	530	430	4.7	0.73	0.71	42
Chloromethane	19,000	19,000	390,000	<15	5.9	2.8	3.4	6.6
EDB	0.94	2.2	20	<5.8	<0.25	<0.25	<0.25	<1.9
EDC	22	51	470	140	1.5	0.67	0.41	<1
Ethylbenzene	220	530	4,900	970	71	230	770	78
GRO	79,000	79,000	1,700,000	120,000	64,000	62,000	35,000	470,000
Isopropylbenzene (Cumene)	83,000	83,000	1,800,000	NA	NA	NA	NA	NA
MTBE	2,200	5,100	47,000	<140	<5.9	<5.9	<5.9	<45
Naphthalene	17	39	360	17	51	75	24	380
PCE	2,200	5,100	47,000	2,000	67	9.5	9.2	<17
Styrene	210,000	210,000	4,400,000	81	14	31	16	<21
TCE	95	200	2,900	6,900	56	24	16	13
Toluene	1,000,000	1,000,000	22,000,000	11,000	370	140	190	130

TABLE 6 – JUNE 2018 SOIL GAS INVESTIGATION

ANALYTE	RBCsg Residential	RBCsg Urban Residential	RBCsg Occupational	SV1	SV2	SV3	SV4	SV5
<b>SOIL GAS (UG/M3) – METHOD TO-15 (VOCS, GRO)</b>								
<b>Vinyl chloride</b>	33	41	2,800	<b>42</b>	<0.84	<0.84	<0.84	<6.4
<b>Xylenes</b>	21,000	21,000	440,000	<b>4,200</b>	<b>409</b>	<b>1,030</b>	<b>3,640</b>	<b>307</b>
<b>2-Propanol</b>	-	-	-	<650	<28	<28	<28	<220

Notes:

- Concentrations are only presented for regulated compounds. Various compounds were detected in these samples without corresponding RBCs for the relevant exposure scenarios.
- - = No RBC value, due to the chemical's nonvolatility, the RBC exceeding three-phase equilibrium partitioning, or the RBC exceeding 1,000,000, or otherwise not posing a risk in this receptor scenario.
- 2-Propanol was used as a sample breakthrough compound. Concentrations of less than 5% (500,000 ug/m3) are acceptable.

Soil Gas exceeding RBCsg – Residential Receptors

Soil Gas exceeding RBCsg – Urban Residential Receptors

Soil Gas exceeding RBCsg – Occupational Receptors

## **APPENDICES**

## **APPENDIX A**

# **UST DECOMMISSIONING PERMITS**



City Of  
**PORTLAND OREGON**

**PORTLAND FIRE & RESCUE**

Prevention Division

1300 SE Gideon St., Portland OR 97202-2419



**FIRE SYSTEMS PERMIT**

**19-100223-000-00-FS**

**Site Address:** 3912 N VANCOUVER AVE  
BRIO

**Issued:** 1/2/19

<b>PROJECT INFORMATION</b>		Occ. Group	Const. Type
<b>Hazardous Materials</b>	<b>Removal</b>		
Project Description: HAZARDOUS/TANK - REMOVAL OF (2) UST'S DISCOVERED DURING SITE GRADING			

<b>APPLICANT</b>	Point Source Solutions *Andy Klopfenstein*	Phone (503) 236-5885
<b>PROPERTY OWNER</b>	BRIO PORTLAND LLC	Phone
<b>CONTRACTOR</b>	Point Source Solutions *Andy Klopfenstein*	Phone

<p align="center"><b>Project Details</b></p> <p>Fire System Valuation 6000</p> <p>Product Other</p> <p>Tank Capacity 1000</p>		<p align="center"><b>Project Details</b></p> <p>Location Underground</p> <p>Product Stored in Tank POSSIBLE GASOLI</p> <p>Tank Material STEEL</p>	
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**OVER THE COUNTER/PLAN REVIEW NOT REQUIRED**

**CERTIFICATION REQUIRED** With the exception of Fire Alarm, Special Hazards, and Paint Booth permits, all permitted work must be performed by or under the direct supervision of an individual with a valid Certificate of Fitness from the Fire Marshal's Office.

**CITY CONTACT** E-Mail: Phone: Fax: (503) 823-3925

**INSPECTION REQUEST PHONE NUMBERS** FIRE SYSTEM PERMITS - Call before 6:00 am, Mon. - Fri. (503) 823-1199

TDD: (503) 823-6868

IVR Inspection Request Number: 4328282

**Subject:** Fwd: TR-18-134 FW: 3902 N Vancouver - ROW Permit Application TH0746  
**From:** Johnny Ramus <johnny@pointsourcesolutions.com>  
**Date:** 1/9/2019, 1:54 PM  
**To:** Andy Klopfenstein <andy@pointsourcesolutions.com>, Gil Cobb <gil@pointsourcesolutions.com>

Sent from my iPhone

Begin forwarded message:

**From:** PBOT Utility Permits <[pbotutilitypermits@portlandoregon.gov](mailto:pbotutilitypermits@portlandoregon.gov)>  
**Date:** January 9, 2019 at 1:48:12 PM PST  
**To:** Johnny Ramus <[johnny@pointsourcesolutions.com](mailto:johnny@pointsourcesolutions.com)>  
**Subject:** RE: TR-18-134 FW: 3902 N Vancouver - ROW Permit Application TH0746

Your permit application review has been completed, and your permit is ready for payment before permit can be issued. Portland Parks & Recreation (PP&R) will be processing your payment on behalf of Portland Bureau of Transportation (PBOT).

Please see the attached for a summary of your charges. Please send or request a copy of the receipt be sent to [pbotutilitypermits@portlandoregon.gov](mailto:pbotutilitypermits@portlandoregon.gov)

Payments can be made:

- By Phone – Please call Portland Parks & Recreation’s Customer Service, 503-823-2525 and select opt 4, Mon-Fri from 8:30am to 5:15pm. Please have your Visa, MasterCard, Discover, or American Express ready.
- By Mail or Walk-in- The Parks Customer Service Center is located at 111 SW Columbia St. They are open 8am -5:30pm. Make check payable to: City of Portland and include Invoice Number in the MEMO line
- Online – Online Payment Gateway-
  - For step by step instructions on how to make a payment through the online customer portal, see attached document.
  - Login: Your login name is your email address
  - Password: To receive your password, click on the “Forgot your Password?” link and an auto generated password will be sent to you.

For more information, please contact me at (503) 823-7035 or [Andrew.Wightman@portlandoregon.gov](mailto:Andrew.Wightman@portlandoregon.gov).

Thank you,

.....

Andrew Wightman | Engineering Tech II

Portland Bureau of Transportation  
1120 SW 5th Avenue, Suite 800  
Portland, OR 97204  
Phone: 503.823.7035  
[andrew.wightman@portlandoregon.gov](mailto:andrew.wightman@portlandoregon.gov)  
[www.portlandoregon.gov/transportation](http://www.portlandoregon.gov/transportation)  
twitter | facebook | instagram | publicalerts

The City of Portland ensures meaningful access to city programs, services, and activities to comply with Civil Rights Title VI and ADA Title II laws and reasonably provides: translation, interpretation, modifications, accommodations, alternative formats, auxiliary aids and services. To request these services, contact 503-823-5185, City TTY 503-823-6868, Relay Service: 711.

-----Original Message-----

From: Johnny Ramus <[johnny@pointsourcesolutions.com](mailto:johnny@pointsourcesolutions.com)>  
Sent: Wednesday, January 09, 2019 1:36 PM  
To: WB DEV SVCS <[WBdevsvcs@portlandoregon.gov](mailto:WBdevsvcs@portlandoregon.gov)>  
Cc: PBOT Utility Permits <[pbotutilitypermits@portlandoregon.gov](mailto:pbotutilitypermits@portlandoregon.gov)>;  
[andy@pointsourcesolutions.com](mailto:andy@pointsourcesolutions.com); [gil@pointsourcesolutions.com](mailto:gil@pointsourcesolutions.com)  
Subject: Re: TR-18-134 FW: 3902 N Vancouver - ROW Permit Application TH0746

Thanks! That's great news!

Andrew, is there anyway we can expedite the final approval of this permit? It would be very helpful if we could pay for it and be able to call in the start of work by the end of the day, keeping this job on schedule. Please let me know if this is possible and if you need anything else from us. Thanks again!

Sent from my iPhone

On Jan 9, 2019, at 11:45 AM, WB DEV SVCS <[WBdevsvcs@portlandoregon.gov](mailto:WBdevsvcs@portlandoregon.gov)> wrote:

Based upon the photo of the existing service provided by the applicant the Water Bureau can approve the proposed permit request.

Portland Water Bureau review fee = \$60

(\$60 for first two utility installations or first 200 feet of

continuous installations. Each additional utility installation for

same permit is \$30.00 per installation reviewed)

Terry Wenz

PWB Capital Project Manager 1

PWB Engineering Trans-Mains Group

(503) 823-3417

-----Original Message-----

From: WB DEV SVCS

Sent: Wednesday, January 9, 2019 10:37 AM

To: [andy@pointsourcesolutions.com](mailto:andy@pointsourcesolutions.com); [gil@pointsourcesolutions.com](mailto:gil@pointsourcesolutions.com);

[johnny@pointsourcesolutions.com](mailto:johnny@pointsourcesolutions.com)

Cc: PBOT Utility Permits <[pbotutilitypermits@portlandoregon.gov](mailto:pbotutilitypermits@portlandoregon.gov)>; WB

DEV SVCS <[WBdevsvcs@portlandoregon.gov](mailto:WBdevsvcs@portlandoregon.gov)>

Subject: RE: TR-18-134 FW: 3902 N Vancouver - ROW Permit Application

TH0746

The Water Bureau cannot approve the existing permit as there is a water service, 3904 N Vancouver Ave in N Failing Ave R/W, immediately adjacent to or within the proposed site work area denoted by the yellow area on the permit.

On the Public Works plans for this service is noted to be killed in the future, so the applicant needs to have the developer pay for this service kill and remove this service prior to the proposed work, for Water Bureau approval.

Portland Water Bureau review fee = \$60

(\$60 for first two utility installations or first 200 feet of

continuous installations. Each additional utility installation for

same permit is \$30.00 per installation reviewed)

Terry Wenz

PWB Capital Project Manager 1

PWB Engineering Trans-Mains Group

(503) 823-3417

-----Original Message-----

From: PBOT Utility Permits

Sent: Wednesday, January 9, 2019 8:13 AM

To: WB DEV SVCS <[WBdevsvcs@portlandoregon.gov](mailto:WBdevsvcs@portlandoregon.gov)>

Cc: Mick, Erin <[Erin.Mick@portlandoregon.gov](mailto:Erin.Mick@portlandoregon.gov)>; Mace, Ryan

<[Ryan.Mace@portlandoregon.gov](mailto:Ryan.Mace@portlandoregon.gov)>

Subject: TR-18-134 FW: 3902 N Vancouver - ROW Permit Application

TH0746

Hello,

I don't see a response to the is review yet, originally sent 12/28/18. This permit is to remove an underground storage tank. GIS show a water service line right next to the back end of the tank. Please review the attached planset and reply with comments/conditions. If you have any issues or concerns that need to be addressed, please contact the utility directly, copying the PBOT Utility Permits box.

Thank you,

.....

Andrew Wightman | Engineering Tech II

Portland Bureau of Transportation

1120 SW 5th Avenue, Suite 800

Portland, OR 97204

Phone: 503.823.7035

[andrew.wightman@portlandoregon.gov](mailto:andrew.wightman@portlandoregon.gov)

[www.portlandoregon.gov/transportation](http://www.portlandoregon.gov/transportation)

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-----Original Message-----

From: andy klopfenstein <[andy@pointsourcesolutions.com](mailto:andy@pointsourcesolutions.com)>

Sent: Tuesday, January 08, 2019 9:46 AM

To: PBOT Utility Permits <[pbotutilitypermits@portlandoregon.gov](mailto:pbotutilitypermits@portlandoregon.gov)>

Cc: Gil Cobb <[gil@pointsourcesolutions.com](mailto:gil@pointsourcesolutions.com)>; Johnny Ramus

<[johnny@pointsourcesolutions.com](mailto:johnny@pointsourcesolutions.com)>

Subject: Re: 3902 N Vancouver - ROW Permit Application TR-18-134

Hi Andrew,

Could you follow up on this for us? We were hoping to pull the tank tomorrow.

Thanks,

Andy

On 12/28/2018 3:30 PM, PBOT Utility Permits wrote:

Hello,

It looks like with the holidays the water bureau is still behind with reviews. I really don't have a good time frame to expect but think getting it back by Thursday is probably not going to happen. Our offices are closed on the 1st. I will let you know as soon as we get the reviews back.

Thank you,

.....

Andrew Wightman | Engineering Tech II Portland Bureau of

Transportation

1120 SW 5th Avenue, Suite 800

Portland, OR 97204

Phone: 503.823.7035

[andrew.wightman@portlandoregon.gov](mailto:andrew.wightman@portlandoregon.gov)

[www.portlandoregon.gov/transportation](http://www.portlandoregon.gov/transportation)

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-----Original Message-----

From: andy klopfenstein <[andy@pointsourcesolutions.com](mailto:andy@pointsourcesolutions.com)>

Sent: Friday, December 28, 2018 3:06 PM

To: PBOT Utility Permits <[pbotutilitypermits@portlandoregon.gov](mailto:pbotutilitypermits@portlandoregon.gov)>

Cc: Gil Cobb <[gil@pointsourcesolutions.com](mailto:gil@pointsourcesolutions.com)>; Johnny Ramus

<[johnny@pointsourcesolutions.com](mailto:johnny@pointsourcesolutions.com)>

Subject: 3902 N Vancouver - ROW Permit Application TR-18-134

Hello,

I've attached a permit application for removing a 1,000-gallon Underground Storage Tank from the right-of-way at 3902 N Vancouver Ave.

The UST is located in the ROW setback on the north side of N Failing Street.

The last permit request we submitted took almost two weeks to make it through the water bureau review. Do you know if they are still backed up and if we can expect a similar processing time? This UST was discovered during grading of the site, and our client is scheduled to begin drilling for piling installation next Thursday. We'll be removing the tank as soon as the permit is authorized and we've called in our start of work.

Thanks,

Andy

<ROW Permit App (3902 N Vancouver).pdf> <IMG\_3636.jpg>

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Attachments:

Billing Summary TR-18-134.pdf

122 KB

**APPENDIX B**  
**LABORATORY ANALYTICAL REPORTS**

1/14/19

Point Source Solutions  
10445 SW Canyon Rd Suite 115  
Portland, OR 97005

Re: BRIO

Dear Point Source Solutions

Enclosed are the results of analysis for samples received by the laboratory on 1/11/2019  
The results related only to the samples included in this report.  
The project was assigned a report number of 89920

If you have any questions concerning this report, please feel free to contact us.

Sincerely,



CY Chan  
QA Officer

**NW-TPHDx LABORATORY REPORT**

Point Source Solutions  
 10445 SW Canyon Rd Suite 115  
 Portland, OR 97005

**SITE NAME:** BRIO **C.O.C. NUMBER:** 89920  
**SITE LOCATION:** 3902 N Vancouver Ave **REPORT DATE:** 1/14/19  
**PROJECT NUMBER:**

**Analytical Method:** NWTPH-Dx **Preparation Method:** EPA3545A  
**Analytes:** Total Diesel and Heavy Oil range petroleum in Soil. Calculated on a dry-weight basis.

Field ID	LAB ID	Diesel (mg/Kg)	Heavy Oil (mg/Kg)	Surrogate Recovery (%)	Analytical Batch	Prepared Batch	Sampling Date
NWTE-S1-8	O3651	ND	ND	112%	78FL1901111	D190111-1	1/11/2019
NETE-S1-8	O3652	19900	ND	110%	78FL1901111	D190111-1	1/11/2019
SWTE-S1-8	O3653	ND	ND	89%	78FL1901111	D190111-1	1/11/2019
SETE-S1-8	O3654	ND	ND	99%	78FL1901111	D190111-1	1/11/2019

Reporting Limit: -- 25 100  
 Surrogate Limit: 50%-150%

**Surrogate is 1-ChloroOctadecane**  
**ND = Not Detected at or below the Reporting Limit**

Results relate only to samples  
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**Chemist Initials:** *KBJ* **Reviewed By:** *MWH*



## PERCENT MOISTURE REPORT

**REPORT NUMBER:** 89920  
**REPORT DATE:** 1/14/19

**ASTM D2974-07a**

**Analytes: Percent Moisture in Sample**

---

LAB ID	Moisture(%)	Date Analyzed
O3651	24.9	1/11/19
O3652	21.7	1/11/19
O3653	21.7	1/11/19
O3654	26.4	1/11/19

## Report Narrative

**Method:** NWTHP-Dx

**Report No.** 89920

**Client:** Point Source Solutions

**Date:** 1/11/2019

### Sample Condition

4 Sample(s) were analyzed for NWTPH-Dx. Sample(s) were received in acceptable condition

### Sample Temperature

Sample(s) arrived within acceptable temperature range

### Sample Hold time

Sample(s) were analyzed within hold time

### Initial Calibration

All criteria were within acceptable limits

### Continuing Calibration Check (CCV)

All criteria were within method limits

### Method Blank

Method Blank meets method limit

### Laboratory Control Sample (LCS)

All criteria were within method limits

### Duplicate Sample

No Duplicate was run on this batch

### Matrix Spike

All criteria were within method limits

### Matrix Spike Duplicate

All criteria were within method limits

### Non-Conformance

No non-conformances were associated with this request except noticed below

**Quality Control for NWTPH-Dx**

Batch Date: 1/11/2019

Units: Soil Blank (mg/Kg) Water Blank (mg/L) CCV &amp; LCS (ug/mL)

Blank Number	PB	Diesel Result	Oil Result	Limits Diesel	Limits Oil	Blank Control	Surr. Recovery	Surr. Limits	Surr. Control
SBK01111	D190111-1	0	0	25	100	PASS	73%	50%-150%	PASS

Diesel LCS Number	PB	Diesel in Extract	Expected Conc.	LCS Recovery (%)	LCS Control Limits	LCS Control	Surr. Recovery	Surr. Limits	Surr. Control
SLC01111	D190111-1	378.18	500.00	76%	±30%	PASS	76%	50%-150%	PASS

Oil LCS Number	PB	Oil in Extract	Expected Conc.	LCS Recovery (%)	LCS Control Limits	LCS Control	Surr. Recovery	Surr. Limits	Surr. Control
SLC01111	D190111-1	384.25	500.00	77%	±30%	PASS	76%	50%-150%	PASS

Diesel MS Number	PB	Sample in Extract	Diesel MS Result	MS Recovery (%)	MS Control Limits	MS Control
BNK42MS	D190111-1	0	378.1813498	76%	70%-130%	PASS

BNK42MSD	D190111-1	0	391.684824	78%	70%-130%	PASS
----------	-----------	---	------------	-----	----------	------

Oil MS Number	PB	Sample in Extract	Oil MS Result	MS Recovery (%)	MS Control Limits	MS Control
BNK42MS	D190111-1	0	384.2539318	77%	70%-130%	PASS

BNK42MSD	D190111-1	0	411.857075	82%	70%-130%	PASS
----------	-----------	---	------------	-----	----------	------

Diesel MSD Number	PB	Diesel MS Result	Diesel MSD Result	RPD	RPD Control Limits	MS Control
BNK42MSD	D190111-1	378.1813498	391.684824	-4%	±30	PASS

Oil MSD Number	PB	Oil MS Result	Oil MSD Result	RPD	RPD Control Limits	MS Control
BNK42MSD	D190111-1	384.2539318	411.857075	-7%	±30%	PASS

**NW-TPHGx LABORATORY REPORT**

Point Source Solutions  
 10445 SW Canyon Rd Suite 115  
 Portland, OR 97005

PROJECT NAME: BRIO  
 SITE LOCATION: 3902 N Vancouver Ave  
 PROJECT NUMBER:

C.O.C. NUMBER: 89920  
 REPORT DATE: 1/14/2019

Analytical Method: NW-TPHGx

Preparation Method: EPA 5035

Analytes: Gasoline in Soil. Calculated on a dry-weight basis.

Field ID	LAB ID	Gasoline (mg/Kg)	Surrogate Recov.(%)	Analytical Batch	Preperation Batch	Sampling Date
NWTE-S1-8	O3651	1980	120%	58PI190114-1	G190114-1	1/11/2019
NETE-S1-8	O3652*	361	131%	58PI190114-1	G190114-1	1/11/2019
SWTE-S1-8	O3653	< 20	117%	58PI190114-1	G190114-1	1/11/2019
SETE-S1-8	O3654	1630	124%	58PI190114-1	G190114-1	1/11/2019

Reporting Limit: -- 20

Surrogate is p-Bromofluorobenzene

\* Results reflect diesel in sample

Results relate only to samples.

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Chemist Initials: MWH

Reviewer Initials: KBJ

---

**PERCENT MOISTURE REPORT**

**REPORT NUMBER:** 89920  
**REPORT DATE:** 1/14/2019

**ASTM D2974-07a**

**Analytes: Percent Moisture in Sample**

---

---

LAB ID	Moisture (%)	Date Analyzed
O3651	25	1/11/2019
O3652	22	1/11/2019
O3653	22	1/11/2019
O3654	26	1/11/2019

## Report Narrative

**Method:** NWTHP-Gx

**Report No.** 89920

**Client:** Point Source Solutions

**Date:** 1/14/2019

### Sample Condition

4 sample(s) were analyzed for NWTPH-Gx. Sample(s) were received in acceptable condition

### Sample Temperature

Sample(s) arrived within acceptable temperature range

### Sample Hold time

Sample(s) were analyzed within hold time

### Initial Calibration

All criteria were within acceptable limits

### Continuing Calibration Check (CCV)

All criteria were within method limits

### Method Blank

Method Blank meets method limit

### Laboratory Control Sample (LCS)

All criteria were within method limits

### Duplicate Sample

No duplicate was run with this batch

### Matrix Spike

All MS within limits except: BLK96

All MSD within limits except: BLK96

### Matrix Spike Duplicate RPD

All criteria were within method limits

### Non-Conformance

No non-conformances were associated with this request except noticed below

**Quality Control for Gasoline in Soil by NWTPH-Gx**

Batch Date: 1/14/2019

<u>Blank</u>	<u>Prep. Batch</u>	<u>Result(mg/Kg)</u>	<u>Accep. Range</u>	<u>Sur. % Recovery</u>	<u>% Accep.</u>
GBK01141	G190114-1	0.00	<20	113%	50%-150%

<u>Spike</u>	<u>Prep. Batch</u>	<u>Result (ug/ml)</u>	<u>Expected (ug/ml)</u>	<u>spike % Recovery</u>	<u>% Accep.</u>
GLC01141	G190114-1	130.17	100.3	130%	70%-130%

<u>MS</u>	<u>A. Batch</u>	<u>Spike (ug/ml)</u>	<u>Sample(ug/ml)</u>	<u>Spike % Recovery</u>	<u>% Accep.</u>
BLK96MS	G190114-1	130.174496	0	130%	70%-130%
BLK96MSD	G190114-1	101.92869	0	102%	70%-130%

<u>MSD</u>	<u>A. Batch</u>	<u>MSD (ug/ml)</u>	<u>MS(ug/ml)</u>	<u>RPD</u>	<u>% Accep.</u>
BLK96MSD	58PI190114-1	101.92869	130.174496	-24%	±30%



Environmental Sciences, Inc.  
2415 SE 11th Ave. Portland Oregon 97214

**CHAIN OF CUSTODY**

Report Number **89924**

AD/QF-0017

Phone(503) 231-9320 FAX(503) 231-9344

Company <b>Point Source Solutions LLC</b>		Phone <b>(503) 916-9254</b>											
Project #		FAX											
Project Name <b>BRTD</b>		Purchase Order #											
Site <b>3902 N Vancouver Ave</b>		Report Attention <b>Gil Cobb</b>											
Samples: Temperature <b>-10c</b> On Ice <input checked="" type="checkbox"/> Yes / No		Turnaround Time: <input checked="" type="checkbox"/> Regular <input type="checkbox"/> 3-5 Business Days											
Collected By <b>J. Ramus</b>		Received By <i>[Signature]</i>											
LAB ID	Field ID	Sampling Date	Sampling Time	Matrix	Container	Volume	NW-TPH-Dx	NW-TPH-GX	NW-TPH-HCID	EPA 8021B (BTEX)	EPA 8270 SIM (PAH)	EPA 8260B	Comments
<b>03651</b>	<b>NWTE-S1-8</b>	<b>1/11/19</b>	<b>10:25a</b>	<b>Soil</b>	<b>1</b>	<b>402</b>	<b>X</b>	<b>X</b>					
<b>03652</b>	<b>NETE-S1-8</b>		<b>10:31a</b>		<b>1</b>		<b>X</b>	<b>X</b>					
<b>03653</b>	<b>SWTE-S1-8</b>		<b>10:41a</b>		<b>1</b>		<b>X</b>	<b>X</b>					
<b>03654</b>	<b>SETE-S1-8</b>		<b>10:45a</b>		<b>1</b>		<b>X</b>	<b>X</b>					
Relinquished by <b>John Ramus</b>		Affiliation <b>PSS</b>	Date <b>1/11/19</b>	Time <b>3:38p</b>	Received by <i>[Signature]</i>		Affiliation <b>WV East</b>	Date <b>1-11-19</b>	Time <b>15:04</b>				



2415 SE 11th Ave  
 Portland, OR 97214  
 Ph: 503-231-9320  
 Fax: 503-231-9344

**Sample Condition Check List :**

Customer Name : P.S.S

COC #: 89920

Method of Delivery: courier client other \_\_\_\_\_

Type of ice: Ice Blue None Cooler Temperature: \_\_\_\_\_

Matrix : Soil Water Other \_\_\_\_\_

- Relinquish signed on Chain of Custody.
- Received by signed on Chain of Custody.
- Chain of Custody filled out.
- Were samples Arrived within Hold Time.
- Rush Turn Around Time Requested. *If yes, how many days* \_\_\_\_\_
- Temperatures measured and written in correct place on COC.
- Correct containers used.
- Sufficient Volume.
- ID on COC and Sample labels match.
- Duplicate jars and vials labeled with a, b, c, d etc.
- All tests logged in checked against the COC.
- The COC scanned into the main office computer.

Yes	No	NA	Comments
/			*
/			*
/			*
/			*
	/		*
/			*
/			*
/			*
		/	*
/			*
/			*

**FOR WATER SAMPLES:**

Trip Blank: Yes Waiver on file  
 No

Submitted by: \_\_\_\_\_

- Was sufficient volume provided for analysis.
- Was sufficient volume provided for QC samples (at least two).
- HCL Preserved vials.  
 HCL LOT Number: \_\_\_\_\_
- Were duplicate jars and vials labeled with a, b, c, d etc.
- Headspace in VOA Vials (>6mm).

Yes	No	Comments
		*
		*
		*

		*
		*

Client Notification/Resolution: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Reviewed: MA

Date: 1-17-19

2/22/19

Point Source Solutions  
10445 SW Canyon Rd Suite 115  
Portland, OR 97005

Re: Brio - 3902 N Vancouver

Dear Point Source Solutions

Enclosed are the results of analysis for samples received by the laboratory on 2/21/2019  
The results related only to the samples included in this report.  
The project was assigned a report number of 90009

If you have any questions concerning this report, please feel free to contact us.

Sincerely,



CY Chan  
QA Officer

## NW-TPHD<sub>x</sub> LABORATORY REPORT

Point Source Solutions  
 10445 SW Canyon Rd Suite 115  
 Portland, OR 97005

<b>SITE NAME:</b>	Brio - 3902 N Vancouver	<b>C.O.C. NUMBER:</b>	90009
<b>SITE LOCATION:</b>	3902 N Vancouver	<b>REPORT DATE:</b>	2/22/19
<b>PROJECT NUMBER:</b>			

**Analytical Method: NWTPH-Dx**

**Preparation Method: EPA3545A**

**Analytes: Total Diesel and Heavy Oil range petroleum in Soil. Calculated on a dry-weight basis.**

Field ID	LAB ID	Diesel (mg/Kg)	Heavy Oil (mg/Kg)	Surrogate Recovery (%)	Analytical Batch	Prepared Batch	Sampling Date
SG1-S1-15	O4761	<b>7210</b>	ND	113%	78FL1902211	D190221-1	2/20/2019
SG2-S1-15	O4762	ND	ND	111%	78FL1902211	D190221-1	2/20/2019
SG3-S1-8	O4763	ND	ND	103%	78FL1902211	D190221-1	2/20/2019

Reporting Limit: --

25

100

Surrogate Limit:

50%-150%

**Surrogate is 1-ChloroOctadecane**

**ND = Not Detected at or below the Reporting Limit**

Results relate only to samples

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**Chemist Initials:** MWH

**Reviewed By:** C.Y. Chan



## PERCENT MOISTURE REPORT

**REPORT NUMBER:** 90009  
**REPORT DATE:** 2/22/19

**ASTM D2974-07a**

**Analytes: Percent Moisture in Sample**

---

LAB ID	Moisture(%)	Date Analyzed
O4761	26.7	2/21/19
O4762	24.3	2/21/19
O4763	29.3	2/21/19

## Report Narrative

**Method:** NWTHP-Dx

**Report No.** 90009

**Client:** Point Source Solutions

**Date:** 2/21/2019

### Sample Condition

3 Sample(s) were analyzed for NWTPH-Dx. Sample(s) were received in acceptable condition

### Sample Temperature

Sample(s) arrived within acceptable temperature range

### Sample Hold time

Sample(s) were analyzed within hold time

### Initial Calibration

All criteria were within acceptable limits

### Continuing Calibration Check (CCV)

All criteria were within method limits

### Method Blank

Method Blank meets method limit

### Laboratory Control Sample (LCS)

All criteria were within method limits

### Duplicate Sample

All criteria were within method limits

### Matrix Spike

All criteria were within method limits

### Matrix Spike Duplicate

No Matrix Spike Duplicate was run on this batch

### Non-Conformance

No non-conformances were associated with this request except noticed below

**Quality Control for NWTPH-Dx**

Batch Date: 2/21/2019

Units: Soil Blank (mg/Kg) Water Blank (mg/L) CCV &amp; LCS (ug/mL)

Blank Number	PB	Diesel Result	Oil Result	Limits Diesel	Limits Oil	Blank Control	Surr. Recovery	Surr. Limits	Surr. Control
SBK02211	D190221-1	0	0	25	100	PASS	93%	50%-150%	PASS

Diesel LCS Number	PB	Diesel in Extract	Expected Conc.	LCS Recovery (%)	LCS Control Limits	LCS Control	Surr. Recovery	Surr. Limits	Surr. Control
SLC02211	D190221-1	428.95	500.00	86%	±30%	PASS	96%	50%-150%	PASS

Oil LCS Number	PB	Oil in Extract	Expected Conc.	LCS Recovery (%)	LCS Control Limits	LCS Control	Surr. Recovery	Surr. Limits	Surr. Control
SLC02211	D190221-1	439.00	500.00	88%	±30%	PASS	96%	50%-150%	PASS

Diesel Dupl. Number	PB	Sample(mg/Kg)	Duplicate(mg/Kg)	RPD (%)	Control Limits	Duplicate Control
O4759	D190221-1	30310.90752	32047.06374	6%	±30%	PASS

Oil Dupl. Number	PB	Sample(mg/Kg)	Duplicate(mg/Kg)	RPD (%)	Control Limits	Duplicate Control
O4759	D190221-1	0	0	0%	±30%	PASS

Diesel MS Number	PB	Sample in Extract	Diesel MS Result	MS Recovery (%)	MS Control Limits	MS Control
O4760MS	D190221-1	5.782829512	413.8925476	82%	70%-130%	PASS

Oil MS Number	PB	Sample in Extract	Oil MS Result	MS Recovery (%)	MS Control Limits	MS Control
O4760MS	D190221-1	0	398.0342279	80%	70%-130%	PASS

**LABORATORY REPORT**

Point Source Solutions  
10445 SW Canyon Rd Suite 115  
Portland, OR 97005

**PROJECT NAME:** Brio - 3902 N Vancouver  
**SITE LOCATION:** 3902 N Vancouver  
**PROJECT NUMBER:**  
**ANALYST**  
**FIELD ID:** SG1-S1-15

**INSTRUMENT** SolaTek  
**REPORT NUMBER:** 90009  
**REPORT DATE:** 2/25/19  
**ACQ. ON** 22Feb2019 9:11am  
**PREP. BATCH** V190222  
**LAB ID:** O4761

**Analytical Method: EPA 8260C**  
**Analyte: Volatile Organics in Soil**

**Preparation Method: EPA 5035A**

<b>Compound</b>	<b>Sample (ug/Kg)</b>	<b>Quant. Limit (ug/Kg)</b>	<b>Qualifier</b>	<b>Dilution Factor</b>
benzene	< 200	200		50
bromobenzene	< 200	200		50
bromochloromethane	< 200	200		50
bromodichloromethane	< 200	200		50
bromoform	< 200	200		50
n-butylbenzene	475	200		50
sec-butylbenzene	480	200		50
tert-butylbenzene	< 200	200		50
chlorobenzene	< 200	200		50
chloroform	< 200	200		50
2-chlorotoluene	< 200	200		50
4-chlorotoluene	< 200	200		50
dibromochloromethane	< 200	200		50
1,2dibromo3-chloropropane	< 200	200		50
1,2-dibromoethane	< 200	200		50
dibromomethane	< 200	200		50
1,2-dichlorobenzene	< 200	200		50
1,3-dichlorobenzene	< 200	200		50
1,4-dichlorobenzene	< 200	200		50
1,1-dichloroethane	< 200	200		50
1,2-dichloroethane	< 200	200		50
1,1-dichloroethene	< 200	200		50
cis-1,2-dichloroethene	< 200	200		50
trans-1,2-dichloroethene	< 200	200		50
1,2-dichloropropane	< 200	200		50
1,3-dichloropropane	< 200	200		50
1,1-dichloropropene	< 200	200		50
cis-1,3-dichloropropene	< 200	200		50
trans-1,3-dichloropropene	< 200	200		50
ethylbenzene	< 200	200		50
hexachlorobutadiene	< 200	200		50
isopropylbenzene	< 200	200		50
p-Isopropyltoluene	524	200		50
methyl-tert-butylether(MTBE)	< 200	200		50
naphthalene	1029	200		50
n-propyl-benzene	< 200	200		50
styrene	< 200	200		50
1,1,1,2-tetrachloroethane	< 200	200		50
1,1,1,2,2-tetrachloroethane	< 200	200		50
tetrachloroethylene	< 200	200		50
toluene	< 200	200		50
1,2,3-trichlorobenzene	< 200	200		50
1,2,4-trichlorobenzene	< 200	200		50
1,1,1-trichloroethane	< 200	200		50
1,1,2-trichloroethane	< 200	200		50
trichloroethene	< 200	200		50
1,2,3-trichloropropane	< 200	200		50
1,2,4-trimethylbenzene	304	200		50
1,3,5-trimethylbenzene	< 200	200		50
xylene(m&p)	< 400	400		50
o-xylene	< 200	200		50
total xylenes	< 600	600		50

Surrogate: Dibromofluoromethane  
Percent Recovery 103

Toluene-d8 90  
p-Bromofluorobenzene 107

**Analyst:** *C.Y. Chan*

**Reviewer Initials:** *MWH*

2415 SE 11th Ave.,  
Portland, OR 97214

**Report Narrative**

**Method:** 8260  
**Client:** Point Source Solutions

**Report No.** 90009  
**Date:** 2/22/2019

**Sample Condition**

Sample was analyzed for 8260. Sample was received in acceptable condition

**Sample Temperature**

Sample(s) arrived within acceptable temperature range

**Sample Hold time**

Sample was analyzed within hold time

**Initial Calibration**

All criteria were within acceptable limits

**Continuing Calibration Check (CCV)**

All criteria were within method limits. Any exceptions are qualified in the body of the report

**Method Blank**

Method Blank meets method limit. Any exceptions are qualified in the body of the report

**Laboratory Control Sample (LCS)**

All criteria were within method limits. Any exceptions are qualified in the body of the report

**Duplicate Sample**

No Duplicate was run on this batch

**Matrix Spike**

All criteria were within method limits

**Matrix Spike Duplicate**

All criteria were within method limits

**Non-Conformance**

No non-conformances were associated with this request except noticed below

**LABORATORY REPORT**

Point Source Solutions  
10445 SW Canyon Rd Suite 115  
Portland, OR 97005

**PROJECT NAME:** Brio - 3902 N Vancouver  
**SITE LOCATION:** 3902 N Vancouver  
**PROJECT NUMBER:**  
**ANALYST**  
**FIELD ID:** SG2-S1-15

**INSTRUMENT** SolaTek  
**REPORT NUMBER:** 90009  
**REPORT DATE:** 2/25/19  
**ACQ. ON** 22Feb2019:41am  
**PREP. BATCH** V190222  
**LAB ID:** O4762

**Analytical Method: EPA 8260C**  
**Analyte: Volatile Organics in Soil**

**Preparation Method: EPA 5035A**

<b>Compound</b>	<b>Sample (ug/Kg)</b>	<b>Quant. Limit (ug/Kg)</b>	<b>Qualifier</b>	<b>Dilution Factor</b>
benzene	< 200	200		50
bromobenzene	< 200	200		50
bromochloromethane	< 200	200		50
bromodichloromethane	< 200	200		50
bromoform	< 200	200		50
n-butylbenzene	< 200	200		50
sec-butylbenzene	< 200	200		50
tert-butylbenzene	< 200	200		50
chlorobenzene	< 200	200		50
chloroform	< 200	200		50
2-chlorotoluene	< 200	200		50
4-chlorotoluene	< 200	200		50
dibromochloromethane	< 200	200		50
1,2dibromo3-chloropropane	< 200	200		50
1,2-dibromoethane	< 200	200		50
dibromomethane	< 200	200		50
1,2-dichlorobenzene	< 200	200		50
1,3-dichlorobenzene	< 200	200		50
1,4-dichlorobenzene	< 200	200		50
1,1-dichloroethane	< 200	200		50
1,2-dichloroethane	< 200	200		50
1,1-dichloroethene	< 200	200		50
cis-1,2-dichloroethene	< 200	200		50
trans-1,2-dichloroethene	< 200	200		50
1,2-dichloropropane	< 200	200		50
1,3-dichloropropane	< 200	200		50
1,1-dichloropropene	< 200	200		50
cis-1,3-dichloropropene	< 200	200		50
trans-1,3-dichloropropene	< 200	200		50
ethylbenzene	< 200	200		50
hexachlorobutadiene	< 200	200		50
isopropylbenzene	< 200	200		50
p-Isopropyltoluene	< 200	200		50
methyl-tert-butylether(MTBE)	< 200	200		50
naphthalene	< 200	200		50
n-propyl-benzene	< 200	200		50
styrene	< 200	200		50
1,1,1,2-tetrachloroethane	< 200	200		50
1,1,1,2,2-tetrachloroethane	< 200	200		50
tetrachloroethylene	< 200	200		50
toluene	< 200	200		50
1,2,3-trichlorobenzene	< 200	200		50
1,2,4-trichlorobenzene	< 200	200		50
1,1,1-trichloroethane	< 200	200		50
1,1,2-trichloroethane	< 200	200		50
trichloroethene	< 200	200		50
1,2,3-trichloropropane	< 200	200		50
1,2,4-trimethylbenzene	< 200	200		50
1,3,5-trimethylbenzene	< 200	200		50
xylene(m&p)	< 400	400		50
o-xylene	< 200	200		50
total xylenes	< 600	600		50

Surrogate: Dibromofluoromethane  
Percent Recovery 95

Toluene-d8 88  
p-Bromofluorobenzene 102

**Analyst:** *C.Y. Chan*

**Reviewer Initials:** *MWH*

2415 SE 11th Ave.,  
Portland, OR 97214

**Report Narrative**

**Method:** 8260  
**Client:** Point Source Solutions

**Report No.** 90009  
**Date:** 2/22/2019

**Sample Condition**

Sample was analyzed for 8260. Sample was received in acceptable condition

**Sample Temperature**

Sample(s) arrived within acceptable temperature range

**Sample Hold time**

Sample was analyzed within hold time

**Initial Calibration**

All criteria were within acceptable limits

**Continuing Calibration Check (CCV)**

All criteria were within method limits. Any exceptions are qualified in the body of the report

**Method Blank**

Method Blank meets method limit. Any exceptions are qualified in the body of the report

**Laboratory Control Sample (LCS)**

All criteria were within method limits. Any exceptions are qualified in the body of the report

**Duplicate Sample**

No Duplicate was run on this batch

**Matrix Spike**

All criteria were within method limits

**Matrix Spike Duplicate**

All criteria were within method limits

**Non-Conformance**

No non-conformances were associated with this request except noticed below

**LABORATORY REPORT**

Point Source Solutions  
10445 SW Canyon Rd Suite 115  
Portland, OR 97005

**PROJECT NAME:** Brio - 3902 N Vancouver  
**SITE LOCATION:** 3902 N Vancouver  
**PROJECT NUMBER:**  
**ANALYST**  
**FIELD ID:** SG3-S1-8

**INSTRUMENT** SolaTek  
**REPORT NUMBER:** 90009  
**REPORT DATE:** 2/25/19  
**ACQ. ON** 22Feb2019 10:12am  
**PREP. BATCH** V190222  
**LAB ID:** O4763

**Analytical Method: EPA 8260C**  
**Analyte: Volatile Organics in Soil**

**Preparation Method: EPA 5035A**

<b>Compound</b>	<b>Sample (ug/Kg)</b>	<b>Quant. Limit (ug/Kg)</b>	<b>Qualifier</b>	<b>Dilution Factor</b>
benzene	< 200	200		50
bromobenzene	< 200	200		50
bromochloromethane	< 200	200		50
bromodichloromethane	< 200	200		50
bromoform	< 200	200		50
n-butylbenzene	< 200	200		50
sec-butylbenzene	< 200	200		50
tert-butylbenzene	< 200	200		50
chlorobenzene	< 200	200		50
chloroform	< 200	200		50
2-chlorotoluene	< 200	200		50
4-chlorotoluene	< 200	200		50
dibromochloromethane	< 200	200		50
1,2dibromo3-chloropropane	< 200	200		50
1,2-dibromoethane	< 200	200		50
dibromomethane	< 200	200		50
1,2-dichlorobenzene	< 200	200		50
1,3-dichlorobenzene	< 200	200		50
1,4-dichlorobenzene	< 200	200		50
1,1-dichloroethane	< 200	200		50
1,2-dichloroethane	< 200	200		50
1,1-dichloroethene	< 200	200		50
cis-1,2-dichloroethene	< 200	200		50
trans-1,2-dichloroethene	< 200	200		50
1,2-dichloropropane	< 200	200		50
1,3-dichloropropane	< 200	200		50
1,1-dichloropropene	< 200	200		50
cis-1,3-dichloropropene	< 200	200		50
trans-1,3-dichloropropene	< 200	200		50
ethylbenzene	< 200	200		50
hexachlorobutadiene	< 200	200		50
isopropylbenzene	< 200	200		50
p-Isopropyltoluene	< 200	200		50
methyl-tert-butylether(MTBE)	< 200	200		50
naphthalene	< 200	200		50
n-propyl-benzene	< 200	200		50
styrene	< 200	200		50
1,1,1,2-tetrachloroethane	< 200	200		50
1,1,1,2,2-tetrachloroethane	< 200	200		50
tetrachloroethylene	< 200	200		50
toluene	< 200	200		50
1,2,3-trichlorobenzene	< 200	200		50
1,2,4-trichlorobenzene	< 200	200		50
1,1,1-trichloroethane	< 200	200		50
1,1,2-trichloroethane	< 200	200		50
trichloroethene	< 200	200		50
1,2,3-trichloropropane	< 200	200		50
1,2,4-trimethylbenzene	< 200	200		50
1,3,5-trimethylbenzene	< 200	200		50
xylene(m&p)	< 400	400		50
o-xylene	< 200	200		50
total xylenes	< 600	600		50

Surrogate: Dibromofluoromethane  
Percent Recovery 96

Toluene-d8 99  
p-Bromofluorobenzene 92

**Analyst:** *C.Y. Chan*

**Reviewer Initials:** *MWH*

2415 SE 11th Ave.,  
Portland, OR 97214

**Report Narrative**

**Method:** 8260  
**Client:** Point Source Solutions

**Report No.** 90009  
**Date:** 2/22/2019

**Sample Condition**

Sample was analyzed for 8260. Sample was received in acceptable condition

**Sample Temperature**

Sample(s) arrived within acceptable temperature range

**Sample Hold time**

Sample was analyzed within hold time

**Initial Calibration**

All criteria were within acceptable limits

**Continuing Calibration Check (CCV)**

All criteria were within method limits. Any exceptions are qualified in the body of the report

**Method Blank**

Method Blank meets method limit. Any exceptions are qualified in the body of the report

**Laboratory Control Sample (LCS)**

All criteria were within method limits. Any exceptions are qualified in the body of the report

**Duplicate Sample**

No Duplicate was run on this batch

**Matrix Spike**

All criteria were within method limits

**Matrix Spike Duplicate**

All criteria were within method limits

**Non-Conformance**

No non-conformances were associated with this request except noticed below

**QUALITY CONTROL REPORT (EPA 8260C)**

**Run Date:** 2/22/2019      **Prep batch:** P2-22-19  
**Report Date:** 2/22/2019      **Analytical batch:** STRA190222

Analyte	BLANK (ug/Kg)	LCS (ug/Kg)	Expected (ug/Kg)	Recovery %
benzene	<4	15	16	95
bromobenzene	<4	13	16	82
bromochloromethane	<4	12	16	77
bromodichloromethane	<4	14	16	89
bromoform	<4	12	16	78
n-butylbenzene	<4	16	16	98
sec-butylbenzene	<4	15	16	93
tert-butylbenzene	<4	15	16	95
chlorobenzene	<4	14	16	90
chloroform	<4	15	16	95
2-chlorotoluene	<4	15	16	93
4-chlorotoluene	<4	13	16	84
dibromochloromethane	<4	14	16	85
1,2-dibromo3-chloropropane	<4	12	16	77
1,2-dibromoethane	<4	13	16	84
dibromomethane	<4	14	16	85
1,2-dichlorobenzene	<4	14	16	86
1,3-dichlorobenzene	<4	12	16	75
1,4-dichlorobenzene	<4	15	16	94
1,1-dichloroethane	<4	15	16	96
1,2-dichloroethane	<4	12	16	74
1,1-dichloroethene	<4	16	16	98
cis-1,2-dichloroethene	<4	16	16	97
trans-1,2-dichloroethene	<4	16	16	100
1,2-dichloropropane	<4	15	16	93
1,3-dichloropropane	<4	12	16	78
1,1-dichloropropene	<4	16	16	98
cis-1,3-dichloropropene	<4	14	16	90
trans-1,3-dichloropropene	<4	14	16	88
ethylbenzene	<4	15	16	95
hexachlorobutadiene	<4	14	16	85
isopropylbenzene	<4	16	16	102
p-Isopropyltoluene	<4	14	16	86
methyl-tert-butylether(MTBE)	<4	13	16	79
naphthalene	<4	15	16	95
n-propyl-benzene	<4	16	16	101
styrene	<4	14	16	90
1,1,1,2-tetrachloroethane	<4	14	16	90
1,1,2,2-tetrachloroethane	<4	12	16	75
tetrachloroethylene	<4	16	16	103
toluene	<4	17	16	104
1,2,3-trichlorobenzene	<4	18	16	110
1,2,4-trichlorobenzene	<4	17	16	108
1,1,1-trichloroethane	<4	16	16	102
1,1,2-trichloroethane	<4	13	16	79
trichloroethene	<4	16	16	97
1,2,3-trichloropropane	<4	12	16	76
1,2,4-trimethylbenzene	<4	14	16	85
1,3,5-trimethylbenzene	<4	15	16	93
xylene(m&p)	<8	31	32	97
o-xylene	<4	15	16	95

Control: 70%-130%

DUPLICATE / MATRIX SPIKE REPORT (EPA 8260C)

Run Date: 2/22/2019      Prep batch: P2-22-19      MSD ID: SBK58MSD  
 Report Date: 2/22/2019      Analytical batch: STRA190222      MS ID: SBK58MS

Analyte	Sample (ug/Kg)	MSD (ug/Kg)	Recovery (%)	Sample (ug/Kg)	Spike (ug/Kg)	Recovery (%)
benzene	0	16	97	0	15	93
bromobenzene	0	15	93	0	13	82
bromochloromethane	0	16	97	0	12	77
bromodichloromethane	0	16	99	0	14	89
bromoform	0	15	92	0	12	78
n-butylbenzene	0	13	82	0	16	98
sec-butylbenzene	0	14	86	0	15	93
tert-butylbenzene	0	14	88	0	15	95
chlorobenzene	1	15	88	1	14	87
chloroform	0	16	98	0	15	94
2-chlorotoluene	0	14	90	0	15	93
4-chlorotoluene	0	14	90	0	13	84
dibromochloromethane	0	16	97	0	14	85
1,2dibromo3-chloropropane	0	15	95	0	12	77
1,2-dibromoethane	0	16	102	0	13	84
dibromomethane	0	16	97	0	14	85
1,2-dichlorobenzene	0	14	85	0	14	86
1,3-dichlorobenzene	0	15	94	0	12	75
1,4-dichlorobenzene	0	14	88	0	15	94
1,1-dichloroethane	0	15	97	0	15	96
1,2-dichloroethane	0	16	98	0	12	74
1,1-dichloroethene	0	15	92	0	16	98
cis-1,2-dichloroethene	0	16	98	0	16	97
trans-1,2-dichloroethene	0	15	92	0	16	100
1,2-dichloropropane	0	15	95	0	15	93
1,3-dichloropropane	0	15	92	0	12	78
1,1-dichloropropene	0	16	98	0	16	98
cis-1,3-dichloropropene	0	17	106	0	14	90
trans-1,3-dichloropropene	0	16	99	0	14	88
ethylbenzene	0	15	94	0	15	95
hexachlorobutadiene	0	13	83	0	14	85
isopropylbenzene	1	15	87	1	16	97
p-Isopropyltoluene	0	14	90	0	14	86
methyl-tert-butylether(MTBE)	0	17	104	0	13	79
naphthalene	0	17	108	0	15	95
n-propyl-benzene	1	14	85	1	16	97
styrene	0	15	93	0	14	90
1,1,1,2-tetrachloroethane	0	16	98	0	14	90
1,1,2,2-tetrachloroethane	0	15	95	0	12	75
tetrachloroethylene	0	15	92	0	16	103
toluene	2	17	94	2	17	95
1,2,3-trichlorobenzene	0	17	103	0	18	110
1,2,4-trichlorobenzene	0	17	104	0	17	108
1,1,1-trichloroethane	0	15	95	0	16	102
1,1,2-trichloroethane	0	15	96	0	13	79
trichloroethene	0	16	98	0	16	97
1,2,3-trichloropropane	0	15	96	0	12	76
1,2,4-trimethylbenzene	1	15	87	1	14	81
1,3,5-trimethylbenzene	0	14	90	0	15	93
xylene(m&p)	0	30	94	0	31	97
o-xylene	0	14	89	0	15	95

Control:      70%-130%      70%-130%

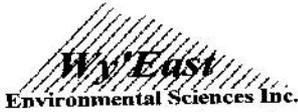


MATRIX SPIKE / MATRIX SPIKE DUPLICATE REPORT (EPA 8260C)

Run Date: 2/22/2019 Prep batch: P2-22-19 MS ID: SBK58MS
Report Date: 2/22/2019 Analytical batch: STRA190222 MSD ID: SBK58MSD

Table with 4 columns: Analyte, MS (ug/Kg), MSD (ug/Kg), RPD (%). Lists various chemical compounds and their corresponding values.





2415 SE 11th Ave  
 Portland, OR 97214  
 Ph: 503-231-9320  
 Fax: 503-231-9344

### Sample Condition Check List

Customer Name: PS

COC #: 90009

Method of Delivery: courier client other

Type of ice: Ice Blue None

Cooler Temperature: 30

Matrix: Soil Water Other

- Relinquish signed on Chain of Custody.
- Received by signed on Chain of Custody.
- Chain of Custody filled out.
- Were samples Arrived within Hold Time.
- Rush Turn Around Time Requested. *If yes, how many days* \_\_\_\_\_
- Temperatures measured and written in correct place on COC.
- Correct containers used.
- Sufficient Volume.
- ID on COC and Sample labels match.
- Duplicate jars and vials labeled with a, b, c, d etc.
- All tests logged in checked against the COC.
- The COC scanned into the main office computer.

Yes	No	NA	Comments
/			*
/			*
/			*
/			*
	/		*
/			*
/			*
/			*
		/	*
/			*
/			*

**FOR WATER SAMPLES:**

Trip Blank: Yes Waiver on file  
 No

Submitted by: \_\_\_\_\_

- Was sufficient volume provided for analysis.
- Was sufficient volume provided for QC samples (at least two).
- HCL Preserved vials.
- HCL LOT Number: \_\_\_\_\_
- Were duplicate jars and vials labeled with a, b, c, d etc.
- Headspace in VOA Vials (>6mm).

Yes	No	Comments
		*
		*
		*

		*
		*

Client Notification/Resolution: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Reviewed: cyp

Date: 2/21/19

## **APPENDIX C**

# **UST DECOMMISSIONING CHECKLIST AND REGISTRATION FORM**



State of Oregon  
Department of  
Environmental  
Quality

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY  
UNDERGROUND STORAGE TANK PROGRAM

**UNDERGROUND STORAGE TANK DECOMMISSIONING  
CHECKLIST AND SITE ASSESSMENT REPORT**

**A. FACILITY INFORMATION:**

This report **MUST** be submitted by the underground storage tank permittee or tank owner, or the licensed DEQ Service Provider on their behalf, **within 30 days following completion of the tank decommissioning or change-in-service regardless of ongoing cleanup work.**

DEQ FACILITY NUMBER: _____
FACILITY NAME: _____
FACILITY ADDRESS: _____
PERMITTEE PHONE: _____ DATE: _____

**B. WORK PERFORMED BY:**

The checklist and site assessment report should be completed and signed by the DEQ licensed supervisor and signed by an executive officer of the DEQ licensed Service Provider on page 6. The tank owner or permittee must review and sign the report on page 6. **NOTE: AN OWNER OR PERMITTEE MAY PERFORM UST SERVICES ONLY IF THEY HAVE TAKEN AND PASSED THE APPROPRIATE UST SUPERVISOR EXAMINATION OFFERED BY A NATIONAL TESTING SERVICE (SEE OAR 340-150-0156 for requirements).**

DEQ Service Provider's License #: _____ Construction Contractors Board License #: _____
Name: _____
Telephone: _____
DEQ Decommissioning Supervisor's License #: _____
Name: _____
Telephone: _____
DEQ Soil Matrix Service Provider's License #: _____ (If applicable)
Name: _____
Telephone: _____
DEQ Soil Matrix Supervisor's License #: _____ (If applicable)
Name: _____
Telephone: _____

**C. DATES:**

Decommissioning/Change-in-Service Notice - Date Submitted: \_\_\_\_\_ (30 days before work starts).

Work Start Telephone Notice - Number issued by DEQ: \_\_\_\_\_ (3 working days before work starts).

DEQ Person Notified: \_\_\_\_\_

Date Work Started: \_\_\_\_\_ Date Work Completed: \_\_\_\_\_

**Note:** Provide the following information if any soil or water contamination is found during the decommissioning or change-in-service. Contamination must be reported by the UST permittee within 24 hours. The licensed service provider must report contamination within 72 hours after discovery unless previously reported.

Date Contamination Reported: \_\_\_\_\_ By: \_\_\_\_\_

DEQ Person Notified: \_\_\_\_\_

**D. OTHER DEQ PERMITS MAY BE NEEDED WHERE SOIL OR WATER CLEANUP IS REQUIRED.**

DEQ Water Discharge Permit #: \_\_\_\_\_ Date: \_\_\_\_\_

Water Disposed to (Location): \_\_\_\_\_

DEQ Solid Waste Disposal Permit #: \_\_\_\_\_ Date: \_\_\_\_\_

Soil Disposal or Treatment Location: \_\_\_\_\_

**E. TANK INFORMATION:**

TANK ID #	DEQ-UST PERMIT #	TANK SIZE IN GALLONS	PRODUCT: GASOLINE, DIESEL, USED OIL, OTHER?		CLOSURE OR CHANGE-IN- SERVICE?			TANK TO BE REPLACED?	
			PRESENT	NEW	TANK REMOVAL	CLOSURE IN PLACE ♦	CHANGE IN SERVICE ♦	YES	NO

**NOTE 1:** Where decommissioned tank(s) are replaced by new underground storage tanks the UST permittee must submit a *General Permit Registration Form to Install and Operate USTs* containing information on the new tanks 30 days before installing them.

**NOTE 2:** Submit a soil sampling plan to the DEQ regional office and receive plan approval prior to starting work if 1) tank is to be decommissioned in-place, 2) tank contents are changed to a non-regulated substance, 3) tank contains a regulated substance other than petroleum, or 4) tank changed to non-regulated use.

**F. DISPOSAL INFORMATION:**

TANK ID #	TANK AND PIPING DISPOSAL METHOD				DISPOSAL LOCATION OF TANK CONTENTS	
	SCRAP	LAND-FILL	OTHER	IDENTIFY LOCATION & PROPERTY OWNER	LIQUIDS	SLUDGES

**NOTE 1:** The tank contents, the tank and the piping may be subject to the requirements of Hazardous Waste regulations. If you have questions, contact the DEQ regional office for your area.

**NOTE 2:** Attach copies of the disposal receipts for the tanks and piping. If the tanks are shipped off-site for reuse provide the name, address and phone number of the person or business receiving the tanks for reuse.

**NOTE 3:** Attach copies of the disposal receipts for the disposal or treatment of liquid or sludge removed from the tanks

**G. CONTAMINATION INFORMATION:**

TANK ID #	GROUND WATER IN PIT ?	PRODUCT ODOR IN SOIL ?	PRODUCT STAINS IN SOIL ?	NUMBER OF SAMPLES	LABORATORY ( NAME, CITY, STATE, PHONE )

**NOTE 1:** Attach a copy of the laboratory report showing the results of all tests on all soil and water samples. The laboratory report must identify sample collection methods, sample location, sample depth, sample type (soil or water), type of sample container, sample temperature during transportation, types of tests, and copies of analytical laboratory reports, including QA/QC information. Include laboratory name, address and copies of chain-of-custody forms.

**NOTE 2:** If contamination is detected and a Level 2 or Level 3 soil matrix cleanup standard is applied to the site, attach a copy of the soil matrix analysis including methods of determining soil type, depth to groundwater, and sensitivity of uppermost aquifer.

**H. SITE SKETCH:** (Show location of adjacent roads, property lines, structures, dispensers, & all USTs. Show North, general direction of ground slope and soil sample locations. Sketch does not need to be drawn to scale. You may attach a separate drawing.)

**I. SAFETY EQUIPMENT ON JOB SITE:**

Fire Extinguisher:	Type/Size: _____	Recharge Date: _____
Combustible Gas Detector:	Model: _____	Calibration Date: _____
Oxygen Analyzer:	Model: _____	Calibration Date: _____

**J. DECOMMISSIONING:**

All Tanks: N/A = Not Applicable (Check (√) Appropriate Box)	YES	NO	UNKNOWN	N/A
1. All electrical equipment grounded and explosion proof?				
2. Safety equipment on job site?				
3. Overhead electrical lines located?				
4. Subsurface electrical lines off or disconnected?				
5. Natural gas lines off or disconnected?				
6. No open fires or smoking material in area?				
7. Vehicle and pedestrian traffic controlled?				
8. Excavation material area cleared?				
9. Rainwater runoff directed to treatment area?				
10. Drained and collected product from lines?				
11. Removed product and residual from tank?				
12. Cleaned tank?				
13. Excavated to top of tank?				
14. Removed tank fixtures? (pumps, leak detection equipment)				
15. Removed product, fill and vent lines?				

**K. TANK ABANDONMENT IN-PLACE:**

All Tanks: N/A = Not Applicable (Check (√) Appropriate Box)	YES	NO	UNKNOWN	N/A
16. Sampling plan approved by DEQ? Date: _____ DEQ Staff: _____				
17. Contamination concerns fully resolved?				
18. Fill Material? Type: _____				



**O. REPORT FILING:**

This report signed by the permittee or tank owner, licensed supervisor and executive officer of the Service Provider, complete with all applicable attachments, must be filed with the DEQ regional office within 30 days after the excavation is backfilled or change-in-service is complete. **Do not wait until any site related cleanup project is completed.** Contact the DEQ regional office prior to filing this report where special circumstances exist at the site (such as water in pit, remaining pockets of contamination, etc.).

**P. HELP WITH THIS REPORT:**

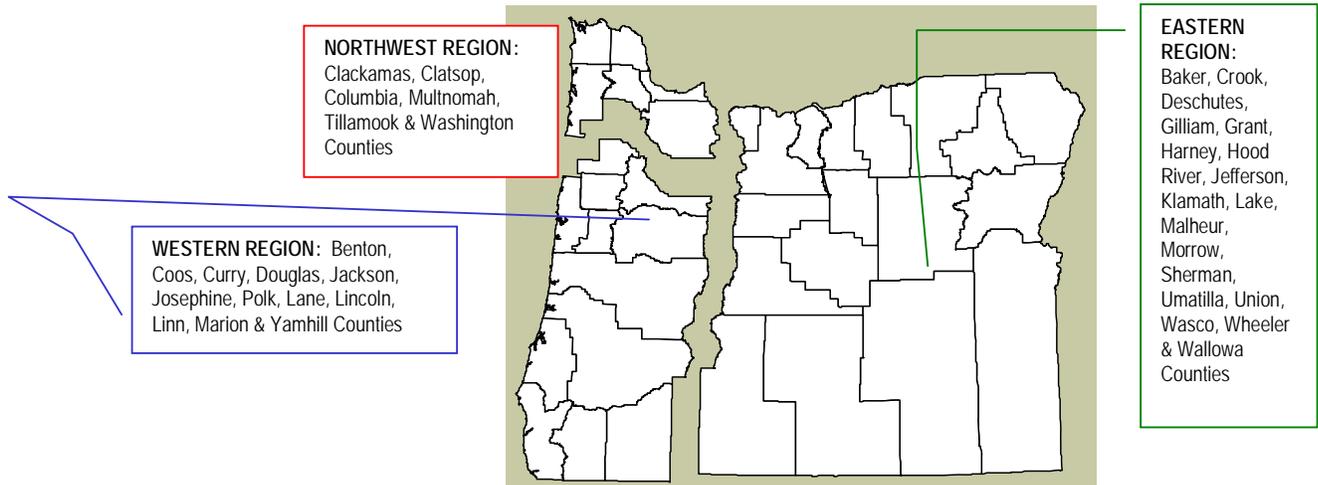
If you have any questions about this decommissioning checklist and site assessment report, please phone your DEQ Regional Office. You can also phone the UST Program’s toll-free number, 1-800-742-7878. This is a message answering machine for calls made within Oregon. Underground Storage Tank Program staff will return your calls within 24 hours. You can also send an e-mail to [tanks.info@deq.state.or.us](mailto:tanks.info@deq.state.or.us). Our regional staff are also available to answer questions regarding tank decommissioning or change-in-service requirements (see below for telephone numbers).

**Q. COPIES OF THE GENERAL PERMIT TO DECOMMISSION OR COMPLETE A CHANGE-IN-SERVICE:**

Obtain copies of the general permit to decommission or complete a change-in-service conditions and requirements, UST Program rules and laws and UST Cleanup rules and laws at:

1. Any of the DEQ offices listed below,
2. By calling the UST HELPLINE at 1-800-742-7878,
3. Send an e-mail to [tanks.info@deq.state.or.us](mailto:tanks.info@deq.state.or.us) or
4. Downloading from the UST home page at:

<http://www.deq.state.or.us/lq/tanks/ust/index.htm>



<p>EASTERN REGION / BEND  475 NE BELLEVUE, SUITE 110  BEND, OR 97701  Phone: 541-388-6146  Fax: 541-388-8283</p>	<p>WESTERN REGION / COOS BAY  381 N SECOND STREET  COOS BAY 97420  Phone: 541-269-2721  Fax: 541-269-7984</p>	<p>WESTERN REGION / MEDFORD  221 STEWART AVE., SUITE 201  MEDFORD, OR 97501  Phone: 541-776-6010  Fax: 541-776-6262</p>
<p>NORTHWEST REGION  700 NE MULTNOMAH ST.  PORTLAND, OR 97232  Phone: 503-229-5263  Fax: 503-229-6945</p>	<p>WESTERN REGION / EUGENE  165 EAST 7TH AVE., SUITE 100  EUGENE, OR 97401  Phone: 541-686-7838  Fax: 541-686-7551</p>	



State of Oregon  
Department of  
Environmental  
Quality

## OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY UNDERGROUND STORAGE TANK PROGRAM

### GENERAL PERMIT REGISTRATION FORM TO DECOMMISSION EXISTING UNREGISTERED TANKS

and

### 30-DAY NOTICE OF INTENT TO DECOMMISSION USTS

- This form for registration of existing tanks that have never been reported to DEQ should be submitted at least 30-days before beginning decommissioning by permanent closure.
- To register existing tanks you must submit pages 4 through 8 of this registration form and a check for the amount of the required registration fee. See page 4 to calculate the required fee.
- If you are registering more than five (5) tanks, please make a copy of pages 7 and 8. List the additional tanks on the copy.
- You must call your regional office to receive authorization to proceed with the decommissioning at least 72 hours prior to beginning work. See page 3 for phone numbers.
- You must submit the Underground Storage Tank Decommissioning Checklist and Site Assessment Report to your local Regional Office within 30 days following completion of the tank decommissioning or change-in-service **regardless if cleanup work is ongoing.**

#### CHECKLIST

1. Be sure signatures are provided for the tank owner, permittee and property owner, **even where one person fills all three roles.**
2. Complete the registration form for all tanks being registered at the facility.
3. Make copies for your records.
4. Enclose your check payable to:  
Oregon Department of Environmental Quality
5. Please return the general permit registration form and applicable registration fee to:

Department of Environmental Quality  
Attn: Revenue Section  
700 NE Multnamah St.  
Portland, Oregon 97232

# INSTRUCTION PAGE

## DESCRIPTION OF GENERAL PERMIT PROGRAM

In lieu of issuing individual permits, Oregon's UST permitting program has adopted a general permit by rule to decommission USTs that identifies the conditions and requirements for temporary and permanent closure or completing a change-in-service. By signing the registration forms, you are certifying that you will comply with all the conditions and requirements of the general permit to decommission USTs.

## DEFINITIONS

Facility – the place where the tank is located.

Decommission – means temporary or permanent closure, including temporary or permanent removal from operation, filling in-place, removal from the ground or change-in-service to non-regulated status.

Owner – means a person who currently owns an UST or owned an UST during the tanks operational life. If registered with the Secretary of State, Corporations Division, the UST owner is the legal business name.

Permittee – means the owner or person designated by the owner, who is in control or has responsibility for daily UST system operation and maintenance, financial responsibility and UST operator training requirements under a general permit pursuant to OAR 340-150-0160 through 340-150-0168. If registered with the Secretary of State, Corporations Division, the permittee is the legal business name. The permittee is mailed the annual compliance fee invoice.

Property owner – means the legal owner of the real property on which an UST is located (the name that appears on the County deed records).

## GENERAL PERMIT REGISTRATION FORM

1. Please fill in the name, address and phone number of the facility. If this facility is registered with DEQ please include the DEQ facility number.
2. Please fill in the number of tanks in the space provided in the general permit registration fee section. For existing tanks not previously registered, back fees are required by OAR 340-150-0110 (6). Calculate the total amount due.
3. Please fill in the tank owner's legal name, address and phone number. The legal name is the name of the tank owner as filed with the Secretary of State, Corporations Division, if applicable. The tank owner must sign the registration form.
4. The tank owner can designate a permittee for each facility. Please ask the permittee in charge of the facility to fill in their legal name, address and phone number. The legal name is the name of the permittee as filed with the Secretary of State, Corporations Division, if applicable. The permittee must sign the registration form.
5. Please fill in the property owner's name, address and phone number. The property owner's name should be the name in the county deed records. The property owner must sign the registration form.
6. There must be three signatures for each completed registration form – the tank owner, permittee and property owner. **IF ONE PERSON FILLS ALL THREE ROLES, THAT PERSON MUST SIGN THREE TIMES.**
7. Complete all sections and pages of the form.

## LICENSED SERVICE PROVIDERS AND SUPERVISORS

ORS 466.750 and OAR 340 – Division 160 requires that licensed service providers perform tank decommission work. If contaminated soil is discovered during decommissioning, and a decision is made to remediate the site using the soil matrix rules, ORS 466.750 and OAR 340 – Division 162 requires that licensed service providers perform soil matrix cleanup work. During certain critical phases as specified in the rules, a licensed supervisor must be present on site to monitor the work. A list of licensed service providers and supervisors is available upon request by calling (503) 229-6652 or toll-free in Oregon 1-800-742-7878 (a message answering machine). **NOTE: AN OWNER OR PERMITTEE MAY PERFORM UST SERVICES ONLY IF THEY HAVE TAKEN AND PASSED THE APPROPRIATE UST SUPERVISOR EXAMINATION OFFERED BY A NATIONAL TESTING SERVICE (OAR 340-150-0156).**

# INSTRUCTION PAGE

## HELP WITH THIS REGISTRATION FORM

If you have any questions about this registration form, please phone the DEQ UST Program at (503) 229-6652. You can also phone the UST Program's toll-free Oregon number, 1-800-742-7878. This is a message answering machine for calls made in Oregon. Underground Storage Tank Program staff will return your call within 24 hours (one business day). You can also send an e-mail to [tanks.info@deq.state.or.us](mailto:tanks.info@deq.state.or.us). Our regional staff is also available to answer questions regarding the general permit program and this general permit registration form (see below for telephone numbers).

## COPIES OF GENERAL PERMIT CONDITIONS AND REQUIREMENTS AND UST PROGRAM RULES

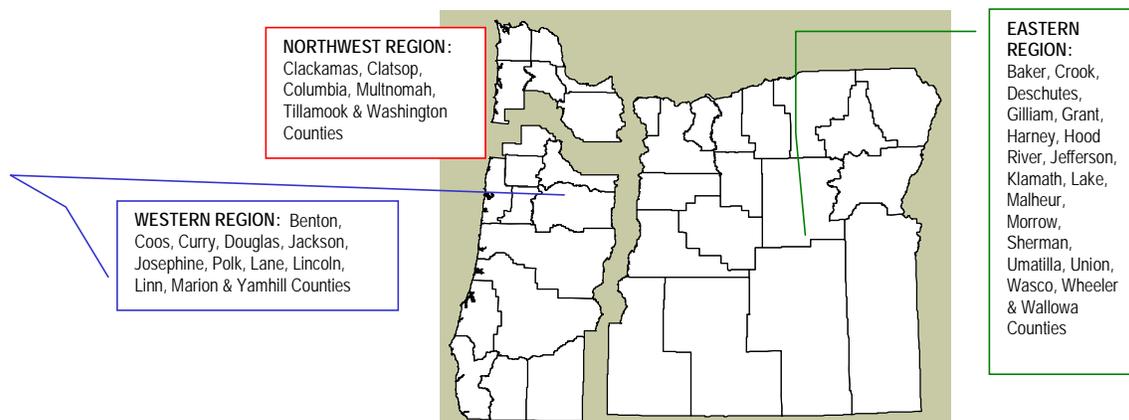
Copies of the general permit to decommission conditions and requirements and UST Program rules and laws can be obtained from:

1. Any of the DEQ offices listed below,
2. By calling the UST HELPLINE at 1-800-742-7878,
3. Send an e-mail to [tanks.info@deq.state.or.us](mailto:tanks.info@deq.state.or.us), or
4. Downloading from the UST home page at:

<http://www.deq.state.or.us/lq/tanks/ust/index.htm>

View Oregon Administrative Rules (OAR) and open Division 150 to OAR 34-150-0166 & 340-150-0168.

View Oregon Revised Statutes (ORS) and open Chapter 466 to ORS 466.706 to 466.845



EASTERN REGION / BEND

Phone: 541-388-6146

NORTHWEST REGION / PORTLAND

Phone: 503-229-5263

UST HELPLINE: 1-800-742-7878  
(toll free in Oregon)

WESTERN REGION / MEDFORD

Phone: 541-776-6010

WESTERN REGION / COOS BAY

Phone: 541-269-2721

WESTERN REGION / EUGENE

Phone: 541-686-7838

GENERAL PERMIT REGISTRATION FORM  
**TO DECOMMISSION UNREGISTERED USTs**

**PLEASE PRINT**

---

**FACILITY NAME:** \_\_\_\_\_

**FACILITY ADDRESS:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**CITY, STATE & ZIP:** \_\_\_\_\_

**PHONE:** \_\_\_\_\_ **FACILITY NUMBER:** \_\_\_\_\_

(If known)

---

**GENERAL PERMIT REGISTRATION FEE**

For existing tanks installed in 1988 or earlier the registration fee is \$500 per tank.

Number of existing tanks being registered \_\_\_\_ x \$500 = \$\_\_\_\_\_ Total Fee Due

Note: If an existing tank was installed after 1988 please contact the Department at 503-229-6652 or 1-800-742-7878 for assistance in calculating the fee.

**For existing tanks** not previously registered and permitted, back fees are due and payable with this general permit registration form in accordance with OAR 340-150-0110 (6).

---

**30-DAY NOTICE OF INTENT TO DECOMMISSION INFORMATION**

Work To Be Performed By: \_\_\_\_\_  
(Name of Permittee, Tank Owner, Property Owner or Licensed Service Provider)

If performed by Service Provider: License # \_\_\_\_\_

Contact Phone: \_\_\_\_\_ Contact Mobile Phone: \_\_\_\_\_

Will tank removal or potential cleanup affect adjacent property or right-of-way property?

Yes \_\_\_\_\_ No \_\_\_\_\_

Date decommissioning is scheduled to begin: \_\_\_\_\_

**GENERAL PERMIT REGISTRATION FORM  
TO DECOMMISSION UNREGISTERED USTs**

**1. TANK OWNER\*** as registered with the Secretary of State, Corporations Division

Name of Official (*Please Print*)



Signature of Official \_\_\_\_\_ Date \_\_\_\_\_

Mailing Address (*Please Print*)

City, State and Zip Code

Area Code and Telephone Number

I will decommission the USTs described on the *Notification and Description of Underground Storage Tank Systems* pages in accordance with the conditions and requirements of the general permit to decommission.

**2. PERMITTEE\*** as registered with the Secretary of State, Corporations Division

Name of Official (*Please Print*)



Signature of Official \_\_\_\_\_ Date \_\_\_\_\_

Mailing Address (*Please Print*)

City, State and Zip Code

Area Code and Telephone Number

I will decommission the USTs described on the *Notification and Description of Underground Storage Tank Systems* pages in accordance with the conditions and requirements of the general permit to decommission.

**3. PROPERTY OWNER** is name that appears on the County deed record for this property.

Name of Official (*Please Print*)



Signature of Official \_\_\_\_\_ Date \_\_\_\_\_

Mailing Address (*Please Print*)

City, State and Zip Code

Area Code and Telephone Number

\* If this facility or tanks are owned by a person, or operated by a permittee that is a business registered with the Secretary of State, Corporations Division, you must use that legal business name for purposes of registering these USTs with the Department. Please make sure that your business registration with the Oregon Corporations Division (503-986-2200) is active or your application may be placed on hold until your registration has been renewed.

**Return Completed Form to:** Department of Environmental Quality  
Attn.: Revenue Section  
700 NE Multnomah St.  
Portland, OR 97232

## Notification and Description of Underground Storage Tank Systems

TYPE OF OWNER		INDIAN COUNTRY	
<input type="checkbox"/> Federal Government <input type="checkbox"/> State Government <input type="checkbox"/> Local Government	<input type="checkbox"/> Commercial <input type="checkbox"/> Private	Tanks are located on land within an Indian Reservation or on trust lands outside reservation boundaries. <input type="checkbox"/>  Tanks are owned by a Native American nation or tribe. <input type="checkbox"/>	Tribe or Nation:
TYPE OF FACILITY			
<input type="checkbox"/> Gas Station <input type="checkbox"/> Petroleum Distributor <input type="checkbox"/> Air Taxi (Airline) <input type="checkbox"/> Aircraft Owner <input type="checkbox"/> Auto Dealership	<input type="checkbox"/> Railroad <input type="checkbox"/> Federal - Non-Military <input type="checkbox"/> Federal - Military <input type="checkbox"/> Industrial <input type="checkbox"/> Contractor	<input type="checkbox"/> Trucking/Transport <input type="checkbox"/> Utilities <input type="checkbox"/> Residential <input type="checkbox"/> Farm <input type="checkbox"/> Other (Explain)	
FINANCIAL RESPONSIBILITY			
<input type="checkbox"/> I will meet the financial responsibility requirements in accordance with OAR 340 – Division 151			
Check All that Apply			
<input type="checkbox"/> Pollution Liability Insurance <input type="checkbox"/> Self Insurance <input type="checkbox"/> Exempt (Federal or State Government)	<input type="checkbox"/> Letter of Credit <input type="checkbox"/> Surety Bond	<input type="checkbox"/> Guarantee <input type="checkbox"/> Local Government	

The financial responsibility requirements are designed to make sure that the tank owner, property owner or permittee can pay the costs of cleaning up leaks and compensating third parties for bodily injury and property damage caused by leaking USTs. A plain language summary of the financial responsibility requirements can be downloaded from the Internet at <http://www.epa.gov/swerust1/pubs/dollars.htm>. For a list of known insurance providers go to <http://www.epa.gov/swerust1/pubs/inlist.htm>.

CONTACT PERSON IN CHARGE OF TANKS			
Name:	Job Title:	Address:	Phone Number (Include Area Code):
CERTIFICATION (Read and sign after completing all section)			
I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.			
Name and official title of owner or owner's authorized representative (Print) Name: Title:	Signature <div style="text-align: center; font-family: cursive; font-size: 1.2em;">John Rawn</div>	Date Signed	

## NOTIFICATION AND DESCRIPTION OF UNDERGROUND STORAGE TANK SYSTEMS

(Complete for each tank at this location)

Tank Identification Number	Tank No.				
<b>1. Status of Tank (Check (√) only one)</b>					
Currently in Use					
Temporarily Out of Use					
Permanently Out of Use					
<b>2. Date of Installation (month &amp; year)</b>					
<b>3. Estimated Total Capacity (gallons)</b>					
<b>4. Material of Construction (Check (√) all that apply)</b>					
Asphalt Coated or Bare Steel					
Cathodically Protected Steel					
Epoxy Coated Steel					
Composite (Steel with Fiberglass)					
Fiberglass Reinforced Plastic					
Lined Interior					
Double Walled					
Polyethylene Tank Jacket					
Concrete					
Excavation Liner					
Unknown					
Other Material, Please Specify					
Has Tank been Repaired?					
Check (√) Box if Yes					
Date of Repairs					
<b>5. Piping – Material (Check (√) all that apply)</b>					
Bare Steel					
Bare Steel Wrapped					
Galvanized Steel					
Fiberglass Reinforced Plastic					
Copper					
Cathodically Protected					
Double Walled					
Secondary Containment					
Unknown					
Not in Contact with Soil					
Other Material, Please Specify					
<b>6. Piping – Type (Check (√) all that apply)</b>					
Suction – No Valve at Tank					
Suction – Valve at Tank					
Pressure					
Gravity Feed					
Has Piping been Repaired?					
Check (√) Box if Yes					
Date of Repair					

**NOTIFICATION AND DESCRIPTION OF UNDERGROUND STORAGE TANK SYSTEMS**

(Complete for each tank at this location)

<b>Tank Identification Number</b>	<b>Tank No.</b>				
-----------------------------------	-----------------	-----------------	-----------------	-----------------	-----------------

**7. Substance Currently or Last Stored in Greatest Quantity by Volume**

**Check (√) Only One Substance per Tank)**

Gasoline					
Diesel					
Gasohol					
Kerosene					
Heating Oil					
Used Oil					

Hazardous Substance					
CERCLA Name and/or					
CAS Number					

Mixture of Substances					
Please Specify Mixture					

Other					
Please Specify Other					

**8. Release Detection (Check (√) all that Apply)**

	Tank	Pipe								
Manual Tank Gauging		<input checked="" type="checkbox"/>								
Tank Tightness Testing										
Inventory Control										
Automatic Tank Gauging										
Vapor Monitoring										
Groundwater Monitoring										
Secondary Containment										
Automatic Line Leak Detector	<input checked="" type="checkbox"/>									
Line Tightness Testing	<input checked="" type="checkbox"/>									
No Release Detection Required (Emergency Generator // Field Constructed Tanks)										
Other Method Allowed by Department										
Other Method, Please Specify										

**9. Spill and Overfill Protection**

Overfill Device Installed					
Spill Device Installed					

**APPENDIX D**  
**WASTE MANAGEMENT PROFILE #129414OR**  
**TRANSACTION HISTORY**



Toggle navigation **WASTE MANAGEMENT**

**WMSolutions.com**

800-963-4776

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**TRANSACTION HISTORY**

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**Viewing Profile # 129414OR**

Between  and   
 Search:  Manifest #,  Ticket #

**Non-Hazardous Waste Summary**

Number of Manifests: 29  
 Total Tons: 420.020  
 Average Tons: 14.483

Export As CSVPrint

Show 50 entries

Date	Profile #	Manifest #	Ticket #	Material	Facility	Carrier	Vehicle	Tons / Tonnes	Material Quantity
03/06/2019	129414OR	NA	1518367	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		7	18.60	18.60
03/06/2019	129414OR	NA	1518328	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		06	13.61	13.61
03/06/2019	129414OR	na	1518321	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		7	18.32	18.32
03/01/2019	129414OR	NA	1517805	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		1	13.55	13.55
03/01/2019	129414OR	NA	1517799	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		7	16.41	16.41
02/25/2019	129414OR	na	1517040	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		7	17.52	17.52
02/20/2019	129414OR	na	1516625	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		06	11.31	11.31
02/20/2019	129414OR	na	1516624	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		05-SOLO	17.16	17.16
02/20/2019	129414OR	na	1516587	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		06	12.69	12.69

Date	Profile #	Manifest #	Ticket #	Material	Facility	Carrier	Vehicle	Tons / Tonnes	Material Quantity
02/20/2019	129414OR	NA	1516568	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		05-SOLO	14.33	14.33
02/20/2019	129414OR	NA	1516516	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		06	10.71	10.71
02/20/2019	129414OR	NA	1516515	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		05-SOLO	13.13	13.13
02/18/2019	129414OR	NA	1516136	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		05-SOLO	15.37	15.37
02/14/2019	129414OR	NA	1515820	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		05-SOLO	13.85	13.85
02/14/2019	129414OR	NA	1515816	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		1	13.71	13.71
02/12/2019	129414OR	NA	1515572	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		1-SOLO	10.80	10.80
02/12/2019	129414OR	NA	1515571	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		1	14.01	14.01
02/12/2019	129414OR	NA	1515559	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		05-SOLO	16.13	16.13
02/12/2019	129414OR	NA	1515548	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		1-SOLO	13.75	13.75
02/12/2019	129414OR	NA	1515541	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		1	13.66	13.66
02/11/2019	129414OR	na	1515505	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		68	17.64	17.64
02/11/2019	129414OR	na	1515506	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		1	11.87	11.87
02/11/2019	129414OR	na	1515503	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		05-SOLO	15.34	15.34
02/11/2019	129414OR	NA	1515500	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		1H	11.29	11.29
01/17/2019	129414OR	NA	1513078	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		05-SOLO	21.09	21.09
01/17/2019	129414OR	na	1513015	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		05-SOLO	17.96	17.96
01/16/2019	129414OR	NA	1512920	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		47-SOLO	18.20	18.20
01/11/2019	129414OR	NA	1512484	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		06	5.36	5.36
01/08/2019	129414OR	NA	1512026	LF02 - Petroleum impacted soil and cleanup debris	Hillsboro Landfill		1	12.65	12.65

Viewing 1 to 29 of 29 Transactions

FirstPreviousNextLast

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**APPENDIX E**

**PBS MEMORANDUM ON SMOKE TESTING RESULTS**



July 3, 2019

Mr. Gil Cobb  
Point Source Solutions  
10445 SW Canyon Road, Suite 115  
Beaverton, Oregon 97005

Via email: [gil@pointsourcesolutions.com](mailto:gil@pointsourcesolutions.com)

Regarding: Brio Lofts Vapor Mitigation System Inspection  
177 North Failing Street  
Portland, Oregon 97227  
PBS Project No. 17798.000



Dear Mr. Cobb:

PBS designed a sub-slab passive soil gas collection system, system sampling and expansion ports, and a ceiling venting location for the proposed Brio Lofts building to be constructed at 177 North Failing Street in Portland, Oregon (project site). A vicinity map showing project location is provided on Figure 1. The project site was historically used as a petroleum fueling facility that was decommissioned for future site development. As part of previous redevelopment actions, three underground storage tanks (USTs) and a hydraulic hoist were removed in accordance with the Oregon Department of Environmental Quality's (DEQ) tank removal guidance<sup>1</sup>. Subsurface investigations conducted in 2017<sup>2, 3</sup> identified areas where residual contamination may present vapor intrusion hazards to future residential uses; as such, DEQ has required vapor mitigation measures be integrated into the design of the project.

PBS recommended installation of a single Absolute Barrier® Y40BAC 40-mil liner (see Absolute Barrier® Y40BAC data sheet, attached). This product is a seven-layer co-extruded geomembrane consisting of flexible, linear-low-density polyethylene (LLDPE) with an inner core of chemically resistant ethylene vinyl alcohol copolymer (EVOH) barrier resin, designed specifically as a barrier against volatile organic compounds (VOCs). This vapor barrier will be used in conjunction with a sub-slab passive soil gas collection system that should further mitigate any soil vapors that may be present following contaminated material removal. The Absolute Barrier® Y40BAC was installed under the entirety of the building footprint as shown on Figure 2 and under the supervision of a manufacturer representative to ensure that the liner was installed according to manufacturer recommendations. A smoke test was conducted on June 7, 2019 to actively test the integrity of the vapor barrier, and identify potential areas where seams or intrusions may be defective. As part of this test, no defects in workmanship or manufacturing defects were observed. A summary of the testing procedures, observations, and conclusions of the smoke test is presented below.

<sup>1</sup> *Underground Storage Tank Closure and Soil Cleanup Report*. Portland: Point Source Solutions, 2015. Oregon DEQ Leaking Underground Storage Tank File Number 26-14-1732.

<sup>2</sup> *Subsurface Environmental Investigation*. Portland: Point Source Solutions, 2017. Oregon DEQ Environmental Cleanup Site Information Site ID 6219.

<sup>3</sup> *LUST File #26-14-1732*. Portland: Point Source Solutions, 2018. Oregon DEQ ECSI Site ID 6219.

### **Smoke Testing Methodology**

PBS conducted the smoke test utilizing a Hurco Portable Power Smoker, powered by a 2.5 horsepower (HP) Honda 4-stroke engine. The Hurco smoke tester can generate up to 700 cubic feet of smoke per minute, and utilizes a non-toxic mineral oil to produce highly visible white smoke. The smoke generator was temporarily connected to the vapor vent pipe within the elevator shaft using flexible piping. Given that the vapor collection system is installed evenly through the subsurface, the smoke distribution was anticipated to be uniform throughout the subsurface throughout the liner.

In addition to the introduction of smoke into the subsurface, a pressurized 10" flat bottom vacuum box was used to inspect the seams and welds. The vacuum box creates a suction seal, and creates a negative pressure of 30 pounds per square inch (PSI) within the area inside of the box. The use of the vacuum box would draw smoke from below the barrier through defects, and allow for visual observation.

Finally, a soap test was also conducted throughout the liner. The smoke test equipment produced positive pressured underneath the liner, and dishwashing soap can be used as another method to observe areas where air may be observed passing through the liner. The generation of bubbles would be an indication of defects within the seams, or defects in the liner material.

### **Testing Conditions**

The smoke test was conducted on Friday June 7, 2019. Initial injection of smoke was initiated at 9:30 am. The temperature at the time of the test was 60 degrees Fahrenheit, with overcast skies. No measurable precipitation was observed during the test. The barometric pressure was steady throughout the test, and was measured at 30.1 inches of mercury. The humidity was 60%, and wind was 5 miles per hour from the east to south east. The weather conditions were ideal for this test, as the fairly static conditions allow for visual observations.

### **Findings and Observations**

At approximately 9:45am, the liner was visibly raised due to the introduction of the smoke beneath the liner. PBS walked the entire perimeter of the foundation and visually inspected each connection of the vapor barrier to the sidewall of the foundation. During this inspection no smoke was observed at these areas. In addition, the vapor barrier was actively pressured in all of these areas, indicating that smoke was present beneath the barrier.

At approximately 10:00am each seam was visually inspected, and no smoke was observed. The seams were under pressure, indicating some was present under the liner. Each seam was vacuum tested and no smoke was observed. Soap was added to each seam, and no bubbles were observed.

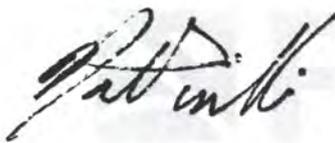
At approximately 10:30 am, each weld intrusion was inspected, and no smoke was observed. Vacuum testing was not performed on the welds, due to physical constraints of the testing device. Soap testing was conducted and no bubbles were observed.

At approximately 11:00 am the smoke generator was turned off and disconnected from the system. Smoke was observed leaving the vent pipe, and the liner slowly returned to grade. During this period, the liner was further inspected, and no smoke was observed in any areas of the barrier.

Photographs were taken throughout the testing, and are included in Appendix A. Based on our visual observations no defects within the liner are present. The use of active pressure beneath the barrier, and a vacuum above the barrier creates a scenario that would not be likely to be seen during occupancy of the facility, and tests the integrity of the workmanship of the liner installation. Based on the results of this test the liner is installed as intended, and meets the requirements of the design. Future sampling, as outlined in the design may still be required, and can be installed at the completion of the project.

Please feel free to contact me at 509.417.7702 or Nathan.Williams@pbsusa.com with any questions or comments.

Sincerely,



Digitally signed by  
Nathan Williams, PE  
Date: 2019.07.03  
15:07:57 -07'00'

Nathan Williams, PE  
Senior Environmental Engineer  
PBS Engineering and Environmental Inc.

cc:

Attachment(s):                      Field Photographs

NW:CN







Photo 1. Foundation Seam



Photo 2. Foundation Seam



Foundation Seam



Photo 3. Drain Intrusion



Photo 4. Welded Seam



Photo 5. Corner Seam



Photo 6. Welded Seam



Photo 7. Previously Repair Seam



Photo 8. Foundation Seam



Photo 9. Single Welded Seam



Photo 10. Welded Seam



Photo 11. Double Welded Seam



Photo 12. Double Welded Seam



Photo 13. Foundation Seam



Photo 14. Extruded Seam



Photo 15. Foundation Seam



Photo 16. Foundation Seam



Photo 17. Double Welded Seam



Photo 18. Foundation Seam



Photo 19. Liner Under Pressure



Photo 20. Foundation Seam



Photo 21. Foundation seam at elevator



Liner Under Pressure



Photo 22. Liner Under Pressure



Photo 23. Liner Under Pressure



Photo 24. Liner Under Pressure



Photo 25. Extrusion Seam



Photo 26. Extrusion Seam



Photo 27. Liner Under Pressure



Photo 28. Liner Under Pressure

**APPENDIX F**  
**PBS RED LINE DESIGN DOCUMENT**



December 16, 2020

Rob Hood  
Oregon Department of Environmental Quality  
700 NE Multnomah St., Suite #600  
Portland, Oregon 97232

Via email:        robert.hood@deq.state.or.us

Regarding:        Revised Brio Lofts Vapor Mitigation System Design  
                      177 North Failing Street  
                      Portland, Oregon 97227  
                      PBS Project No. 17798.000

Dear Mr. Hood:

On February 1, 2019 PBS submitted the second revision of the Brio Lofts Vapor Mitigation System Design (Design) to DEQ. DEQ responded on February 13, 2019 requesting redlines showing the second revision edits. On February 15, 2019, PBS emailed DEQ, asking if DEQ would be amenable to a response to comments in the memorandum, clearly defining how the comments were incorporated rather than a redline version of the document as the majority of the changes were to the drawings. A response was not received, and PBS submitted the updated Design to DEQ in April 2019 with no red lines. Below please find the responses to the DEQ questions and where in the submittal these questions were addressed. The attached Brio Lofts Vapor Mitigation System Design document has also been red-lined, satisfying the request of DEQ.

## **Revision 2**

-Page 1. PBS proposes absolute Barrier Y40BAC 40-mil liner. Based on the specs and testing performance, the Y40BAC liner appears adequate. Proper installation, including welding of the seams, and testing of all welds and seals at points of penetration in accordance with the manufacturer's recommendations will be critical to achieving desired vapor mitigation performance. The text and drawings should also specify how and where the liner will be installed.

**In the updated letter, under the Vapor Barrier System section, the last two sentences state how and where the liner will be installed.**

-Page 2. Sampling and Expansion Ports. Two sub-slab vapor ports (Vapor Pins) will be installed in accordance with the SOP. The text should specify whether this will be a temporary or permanent installation. DEQ notes that vapor points should be installed into the underlying crushed rock below the vapor barrier, but it is unclear whether that will be achieved using the vapor pins. DEQ suggests that PBS provide a detailed drawing that shows the vapor pin installation.

**The two, sub-slab vapor ports are permanent installations, as stated in the first sentence of the section titled Sampling and Expansion Ports of the updated letter. A detailed drawing showing the vapor pin installation can be found in the attachments of the updated letter.**

-Page 2. Vapor Monitoring Program. The proposed vapor monitoring program is inadequate. It calls for indoor air sampling, although the locations identified are the sub-slab vapor pins. It is not clear the consultant understands the difference. Also, the text does not provide details regarding the schedule for sampling. If these details will be provided in a separate document, the text should state that. DEQ recommends that the PBS review an example DEQ-approved vapor monitoring plans such as the one for Community Vision (aka Grocery Market, LUST #26-94-0033), 1<sup>st</sup> and Arthur (aka Unocal #5664, LUST #26-96-0095), or similar engineering plans. Typically, sub-slab monitoring is performed followed by contingency indoor air monitoring if warranted based on the sub-slab results. Samples should be analyzed for total gasoline and volatile organic compounds, preferably by EPA Method TO-15. The plans are located in DEQ's Leaking Underground Storage Tanks database under their respective file numbers.

Establishment of a Vapor Monitoring Program was not within the scope of this project and the PBS Sub-Slab Vapor and Soil Gas Sampling Standard Operating Procedure and Indoor Air Sampling Volatile Organic Compounds Standard Operating Procedure were removed from the original submittal. As stated in paragraph two of the Sampling and Expansion Ports section of the updated letter, the final sampling procedures will be detailed in a Vapor Monitoring Program developed by Point Source Solutions as a separate deliverable.

-Figure 1. Note 6 incorrectly states that 2 layers of 20-mil Drago wrap liner will be installed. It should be corrected to specify use of the Absolute Barrier Y40BAC 40-mil liner.

Figure 1, Note 6 has been updated to specify the use of the Absolute Barrier Y40BAC 40-mil liner.

-Figure 2. It is difficult to assess whether the interior vapor point is located in the most vulnerable portion of the building since the first floor layout is not provided. If there are no enclosed spaces where vapors are likely to be trapped, then this central location may be acceptable, however insufficient information is provided.

Vapor points are being installed on the lower level parking garage using vapor pins, which are a permanent installation. Figure 2 shows the locations of the vapor points. The figure has also been updated to show the lower level foundation plan. Previous comments about interior vapor points on the first floor are not applicable.

-SOP for sub-slab vapor and soil gas sampling. The SOP and text of the plan indicate sampling will be from sub-slab points. However, Figure 3 shows sampling from a vapor port connected to the pvc piping underground in addition to the two sub-slab points. Please clarify. For samples analyses, please analyze the samples for TPH-G and VOCs by EPA Method TO-15 as earlier discussed. Please ensure that the lab can meet DEQ's soil gas screening levels.

This design provides the building and sampler with three sampling locations. Two are vapor points and one is a sample port that is connected to the riser pipe. The vapor monitoring program, which details sampling frequency, analytical methods, and sampling procedures will be a stand-alone document developed by Point Source Solutions. As a result, the PBS Sub-Slab Vapor and Soil Gas Sampling Standard Operating Procedure and Indoor Air Sampling Volatile Organic Compounds Standard Operating Procedure have been removed.

## **Revision 1**

-First paragraph, line 4. There is a typo that should be corrected. "...petroleum fueling facility that **was been** decommissioned..."

First paragraph, line 4 of the updated letter has been changed to read "... petroleum fueling facility that was decommissioned..."

1. Vapor Barrier System. The text states that a single 40-mil liner option is considered to be most cost effective and "if a cross-laminate polyethylene is used, puncture and tear-resistant." PBS should specify the specific liner to be used and provide a technical datasheet for DEQ approval. The text also states that the 40-mil liner may be difficult to seal. Details regarding the approach for sealing and leak testing the liner should be discussed.

In the updated letter, under the Vapor Barrier System section, the last two sentences specify that a single Absolute Barrier® Y40BAC 40-mil liner will be installed. It also explains that the liner will be installed under the entirety of the building footprint as shown in Figure 2. The liner will be installed according to manufacturer recommendations and a smoke test will be conducted following installation to ensure there are no leaks. A technical datasheet for the Absolute Barrier® Y40BAC liner can be found in the attachments of the updated letter.

2. Sampling and Expansion Ports. A single sampling port is proposed. DEQ recommends a minimum of 2 sample ports.

This design provides the building and sampler with three sampling locations. Two are vapor points and one is a sample port that is connected to the riser pipe. The three sampling locations are shown in Figure 2.

3. Table 1.

- a. The recommended single 40-mil liner is flagged as "may not be chemically resistant". The memo or table should discuss chemical compatibility issues and justify use of the selected product given the environmental conditions at the site.

The technical data sheet for the liner, provided in the attachments of the updated cover letter, states the proposed liner is designed specifically as a barrier against radon, methane, and VOCs.

- b. The unit costs for the 20-mil and 40-mil liners are the same, but the total capital costs differ by \$12,000. This difference should be explained.

In the attachments to the updated cover letter, please see note 3 in Table 1. The unit cost per square foot of the 20mil liner is approximately equivalent to that of a 40-mil liner, however two layers of the 20-mil liner are proposed to be applied whereas only one layer of the 40-mil liner is required.

c. The chemical-specific vapor retardant/absorptive liner is the only option identified as requiring leak testing following installation. Leak and seal testing should be performed for each of the options identified in Table 1.

Note 1 in Table 1 states that leak testing is "...to be performed following installation of chosen vapor barrier..."

4. Tables 2 and 3 are not referenced in the text.

In the updated letter, Table 2 is referenced in the second sentence of the Sub-Slab Passive Soil Gas Collection System section. In the section titled Sampling and Expansion Ports, Table 3 is referenced in the third sentence of paragraph two.

5. Figure 1 is not referenced in the text.

Please see line 4, paragraph 1 of the updated letter for a text reference to Figure 1.

a. Note 6 indicates that filter fabric will be installed to protect the vapor barrier from punctures. This fabric should be specified in the drawings for DEQ review and approval.

Upon further consultation with the vapor barrier manufacturer, a filter fabric is not necessary. References to a filter fabric have been removed.

b. Note 7 indicates that seams will be overlapped by 6-inches. Requirements for seam sealing should also be specified. DEQ expects that liner seams be professionally welded in accordance with manufacturer recommendations.

Note 7, now Note 6 in the updated version, has been revised to state, "Seams shall be taped in accordance with manufacturer installation instructions."

7. Figure 2 is labeled as "For Reference Only". Design drawings should be submitted to DEQ for review and approval. All final drawings will need to be stamped (and signed) by an Oregon registered professional engineer.

a. Note 1 indicates that the vapor barrier and installation requirements are provided in the architects drawings. Any relevant drawings should be provided for DEQ review.

These plans were not prepared by PBS. PBS only used the existing building footprint to provide design details for their portion of this project. In the General Notes section of Figure 2, it indicates the original figure was provided by Visser Engineering Company and the figure is used to show layout of depressurization system. Legacy notes have been removed from drawings submitted to DEQ.

b. The only proposed sample port is located at the stub up location in the SW corner of the building which is representative of vapors collected in the perforated 4" schedule 40 PVC to be installed along the perimeter of the building. This does not represent the worst case scenario for

vapor intrusion risk. A minimum of 2 sub-slab vapor ports should be installed in areas that either represent the highest subsurface contaminant conditions or are centrally located away from any exterior walls.

This design provides the building and sampler with three sampling locations. Two are vapor points and one is a sample port that is connected to the riser pipe. These locations are indicated on Figure 2.

6. Figure 3. A detail should be provided showing the offset and height requirements for the vent riser

Offset and height requirements are stated in the Roof Venting Location Detail on Figure 3.

7. The vapor mitigation system design should be paired with an appropriate vapor monitoring program to assess both pre- and post-occupancy conditions similar to plans developed for your other VI sites (this should include baseline, performance, and compliance monitoring).-

PBS Sub-Slab Vapor and Soil Gas Sampling Standard Operating Procedure and Indoor Air Sampling Volatile Organic Compounds Standard Operating Procedure have been removed pending the design by Point Source Solutions.

Please feel free to contact me at 503.935.5516 or lance.moen@pbsusa.com with any questions or comments.

Sincerely,

Lance A. Moen, PE  
Senior Environmental Engineer

cc: Gil Cobb (gil@pointsourceolutions.com)

Attachments: Revised Brio Lofts Vapor Mitigation System Design

EL:LM

# **Appendix A**

## **Revised Brio Lofts Vapor Mitigation System Design**



December 2, 2020

Mr. Gil Cobb  
Point Source Solutions  
10445 SW Canyon Road, Suite 115  
Beaverton, Oregon 97005

Via email: gil@pointsourceolutions.com

Regarding: Revised Brio Lofts Vapor Mitigation System Design  
177 North Failing Street  
Portland, Oregon 97227  
PBS Project No. 17798.000

Dear Mr. Cobb:

PBS prepared design drawings and manufacturer specifications for a vapor barrier, sub-slab passive soil gas collection system, system sampling and expansion ports, and a ceiling venting location for the proposed Brio Lofts building to be constructed at 177 North Failing Street in Portland, Oregon (project site). **A vicinity map showing project location is provided on Figure 1. The project site was historically used as a petroleum fueling facility that was decommissioned for future site development.** As part of previous redevelopment actions, three underground storage tanks (USTs) and a hydraulic hoist were removed in accordance with the Oregon Department of Environmental Quality's (DEQ) tank removal guidance<sup>1</sup>. Subsurface investigations conducted in 2017<sup>2, 3</sup> identified areas where residual contamination may present vapor intrusion hazards to future residential uses; as such, DEQ has required vapor mitigation measures be integrated into the design of the project. Components of the system design are described below.

### **Vapor Barrier System**

**PBS evaluated three different vapor barrier systems, including a dual 20-mil liner, a single 40-mil liner, and a chemical-specific vapor retardant/absorptive liner. Evaluation findings are summarized in Table 1, attached.** PBS recommends installation of a single Absolute Barrier® Y40BAC 40-mil liner (see Absolute Barrier® Y40BAC data sheet, attached). This product is a seven-layer co-extruded geomembrane consisting of flexible, linear-low-density polyethylene (LLDPE) with an inner core of chemically resistant ethylene vinyl alcohol copolymer (EVOH) barrier resin, designed specifically as a barrier against volatile organic compounds (VOCs). This vapor barrier will be used in conjunction with a sub-slab passive soil gas collection system that should further mitigate any soil vapors that may be present following contaminated material removal. **The Absolute Barrier® Y40BAC 40-mil liner will be installed under the entirety of the building footprint as shown on Figure 2 and under the supervision of a manufacturer representative to ensure it is installed according to manufacturer recommendations. A smoke test will be conducted following installation to ensure the vapor barrier has no leaks.**

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<sup>1</sup> *Underground Storage Tank Closure and Soil Cleanup Report*. Portland: Point Source Solutions, 2015. Oregon DEQ Leaking Underground Storage Tank File Number 26-14-1732.

<sup>2</sup> *Subsurface Environmental Investigation*. Portland: Point Source Solutions, 2017. Oregon DEQ Environmental Cleanup Site Information Site ID 6219.

<sup>3</sup> *LUST File #26-14-1732*. Portland: Point Source Solutions, 2018. Oregon DEQ ECSI Site ID 6219.

### **Sub-Slab Passive Soil Gas Collection System**

Approximately 450 linear feet of perforated 4" diameter Schedule 40 polyvinyl chloride (PVC) piping is to be installed in the locations shown on Figure 2. **The approximate amount of system piping required is quantified in Table 2.** Soil vapor collection piping will be placed beneath proposed concrete joint locations, as these locations would represent the most likely exposure pathway for vapor migration. The collection system would then passively allow for the soil vapors to vent through a single discharge point on the roof of the building as described below. All PVC joints are to be primed and sealed in accordance with ASTM F 656 and ASTM D 2564, respectively. Additional details pertaining to the sub-slab passive soil gas collection system installation are detailed on the attached drawings.

### **Sampling and Expansion Ports**

To assess the worst-case scenario for vapor intrusion risk, **two [permanent] sub-slab vapor ports (VAPOR PIN® devices) will be installed: one in the southwest corner of the building, which is in closest proximity to soils historically indicating elevated concentrations of petroleum hydrocarbons<sup>2</sup> and one that is centrally located away from exterior walls.** Sub-slab vapor ports will be installed in accordance with Method 1 of the Sub-Slab Vapor and Soil Gas Sampling Standard Operating Procedure, attached. Proposed sub-slab VAPOR PIN® device locations are shown on Figure 2.

To assess the quality of vapors in the sub-slab depressurization system, a sampling port will be installed at the stub-up location shown on Figure 2. A sampling port detail is provided on Figure 3. **Materials to be used in this sampling port are listed in Table 3.** The sampling port consists of corrosion resistant, lead-free brass fittings sealed with polytetrafluoroethylene tape. Future samples can be collected from the installed 3/8" barb fitting using a Tedlar bag and Teflon tubing. **[Final sampling procedures will be detailed in a Vapor Monitoring Program developed by Point Source Solutions as a separate deliverable.]**

An expansion port will be installed above the sampling port at the stub-up location. The expansion port consists of a primed and sealed 4" diameter Schedule 40 PVC 45-degree hub x hub x hub wye joint. The wye portion of the joint will be capped during initial construction; the wye can be uncapped for future expansion. An expansion port detail is provided on Figure 3, attached.

### **Venting Location**

Soil vapors should be vented to a location that minimizes potential exposure. The project site located in a busy commercial and residential area. The northern property line is shared with a landscaping company. To the east of the property are a restaurant and brewery. The property is bound to the south by North Failing Street. Across North Failing Street are several single-family residences. The property is bound to the west by North Vancouver Avenue, a thoroughfare through North Portland. Several residences are immediately west of North Vancouver Avenue.

Balconies are to be constructed on the second and third floors of the building: one at the north end of the courtyard (third floor only), one on the north wall, and one at the northeast corner of the building. Given the property location and adjacent businesses and residences, the optimal riser venting location is the southwest corner of the building. This location is as far away from all balconies as possible. In addition, it is on the corner of a busy street on which passersby are unlikely to loiter. This location minimizes exposure to patrons who may sit outside of the brewery and restaurant on the east side of the project site. It also minimizes exposure to patrons of the landscaping business north of the project site.

### **Vapor Monitoring Program**

Samples will be collected from the two sub-slab monitoring locations shown on Figure 2 and analyzed for total gasoline and volatile organic compounds by EPA Method TO-15. Results will be compared to applicable soil gas and air concentrations cited in the most recent revision of Risk-Based Concentrations for Individual Chemicals issued by the Oregon Department of Environmental Quality<sup>4</sup>. These results will be used to determine whether indoor air monitoring is warranted. [The vapor monitoring program and sampling schedule is to be developed by Point Source Solutions as a separate deliverable.]

The proposed system will be approved by DEQ prior to construction. Please feel free to contact me at 503.935.5516 or Lance.Moen@pbsusa.com with any questions or comments.

Sincerely,

Lance A. Moen, PE  
Senior Environmental Engineer  
PBS Engineering and Environmental Inc.

Attachment(s): Figure 1. Cover Sheet  
Figure 2. Sub-Slab Passive Soil Gas Collection System Layout  
Figure 3. Details  
Table 1. Vapor Barrier Alternatives Assessment  
Table 2. Sampling and Expansion Port Component Summary  
Table 3. Sub-Slab Passive Soil Gas Collection System Piping Summary  
Absolute Barrier® Y40BAC High Performance LLDPE/EVOH Geomembrane Gas Barrier Data Sheet  
VAPOR PIN® Device Detail Drawings

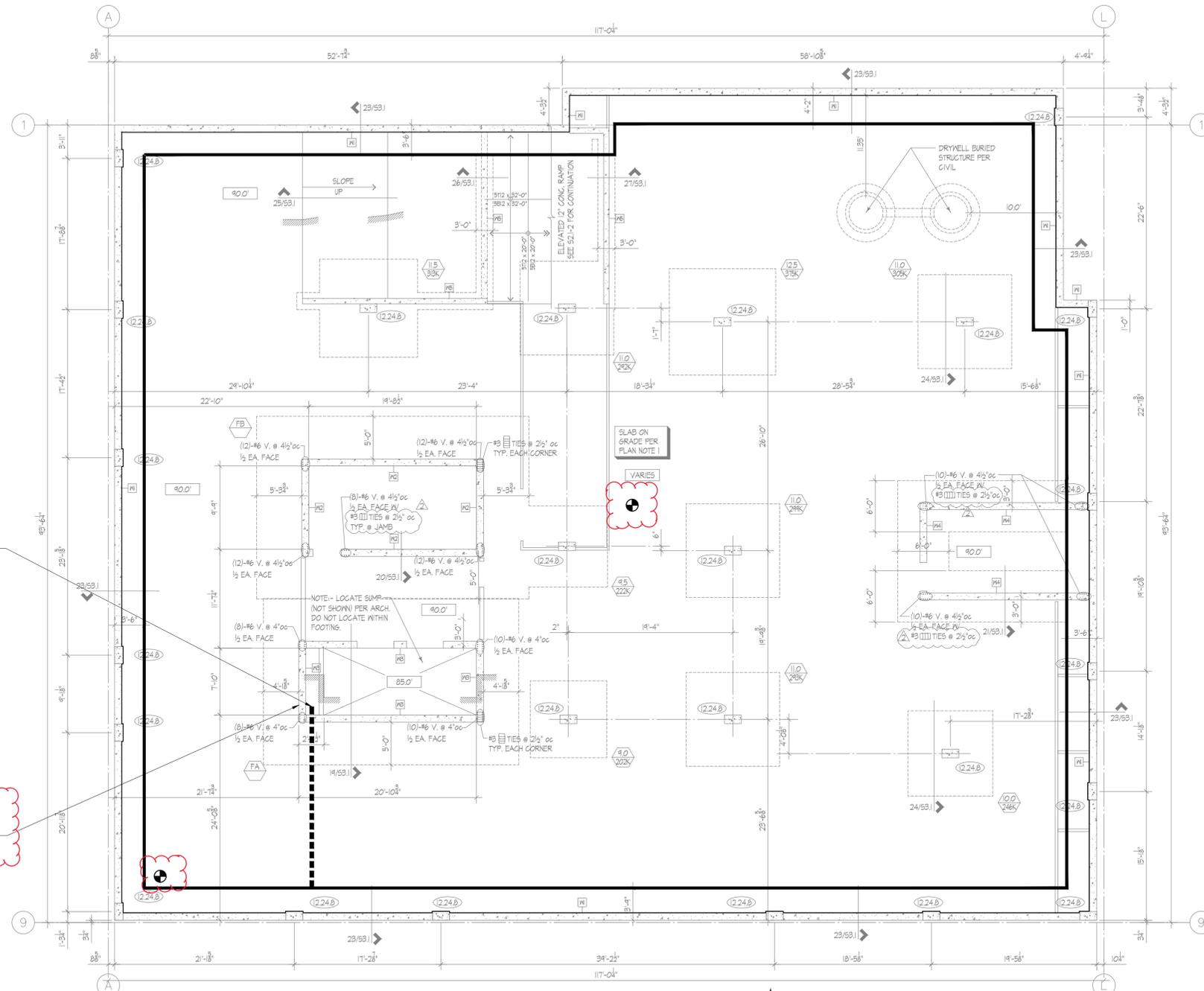
KB:NW

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<sup>4</sup> <https://www.oregon.gov/deq/FilterDocs/RBDMTable.pdf>



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FOUNDATION PLAN  
SCALE: 1" = 8'

- LEGEND**
-  PERFORATED 4" SCHEDULE 40 PVC
  -  PROPOSED SUB-SLAB VAPOR PORT AND VAPOR MONITORING LOCATION

**GENERAL NOTES**

ORIGINAL FIGURE PROVIDED BY VISSER ENGINEERING COMPANY, INC. THIS FIGURE IS USED FOR THE SOLE INTENT OF DEMONSTRATING THE LAYOUT OF THE DEPRESSURIZATION SYSTEM.

Full Size Sheet Format Is 22x34; If Printed Size Is Not 22x34, Then This Sheet Format Has Been Modified & Indicated Drawing Scale Is Not Accurate.

SUB-SLAB PASSIVE SOIL GAS COLLECTION SYSTEM LAYOUT FOR:  
**BRIO LOFTS VAPOR MITIGATION SYSTEM**  
 177 N FAILING ST PORTLAND, OR 97227

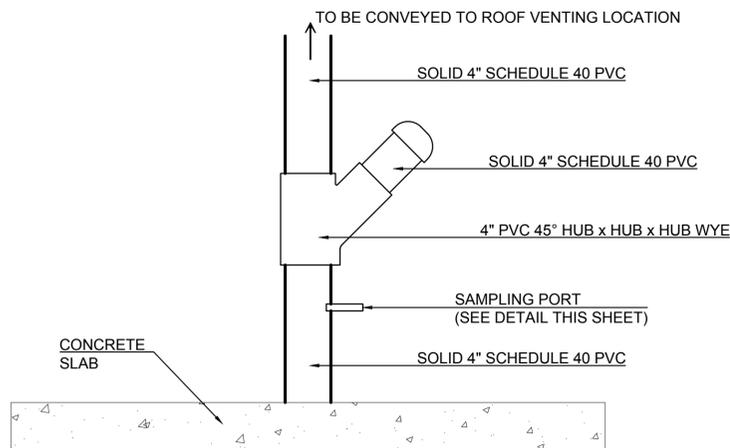


DESIGNED: KB  
 CHECKED: NPW  
 NOV 2020  
 17798-000

SHEET ID  
**C02**

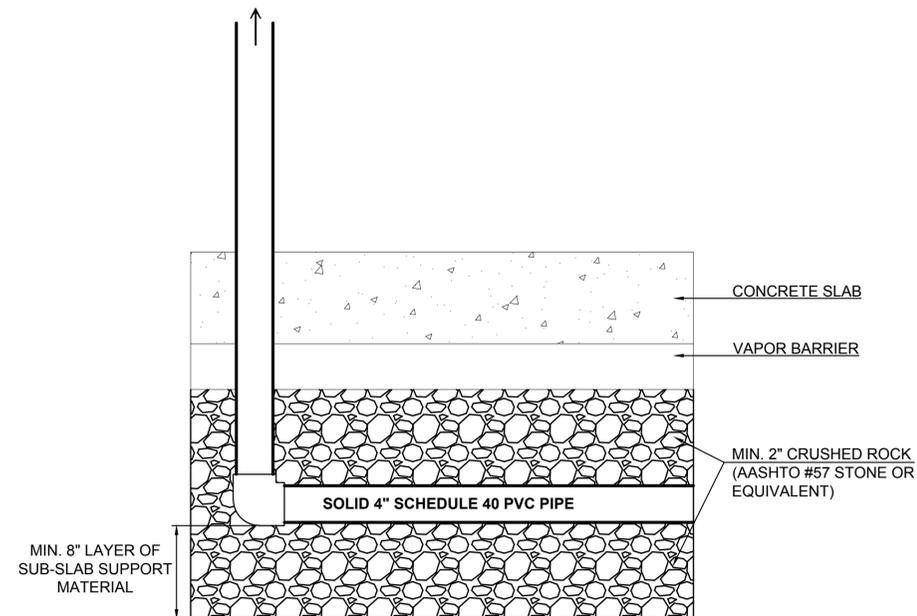
PBS Engineering and Environmental Inc.  
 4412 SW Corbett Avenue  
 Portland, OR 97239  
 503.243.1939  
 pbssusa.com





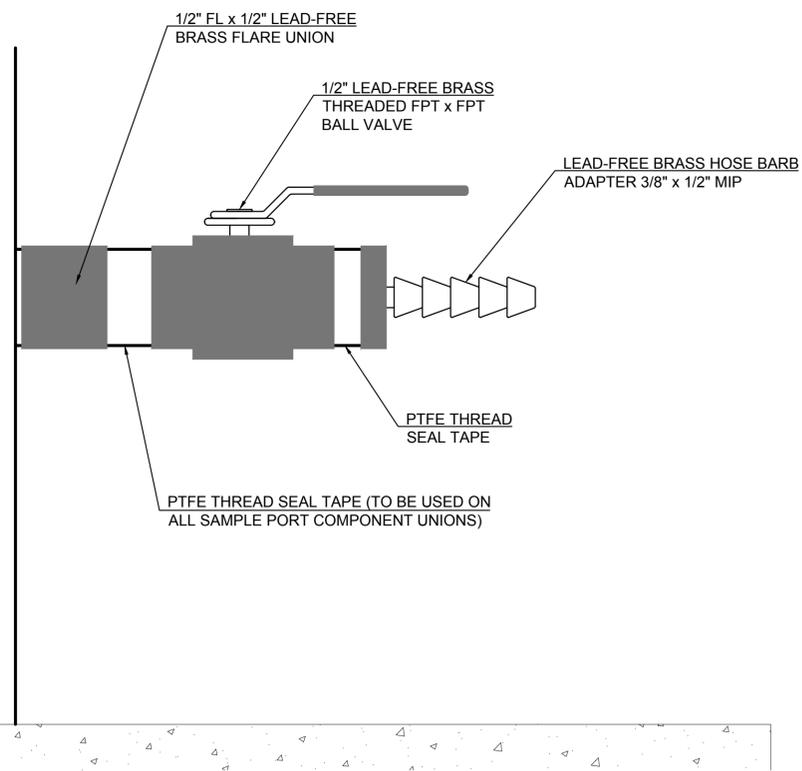
**STUB UP LOCATION DETAIL**

SCALE: NONE



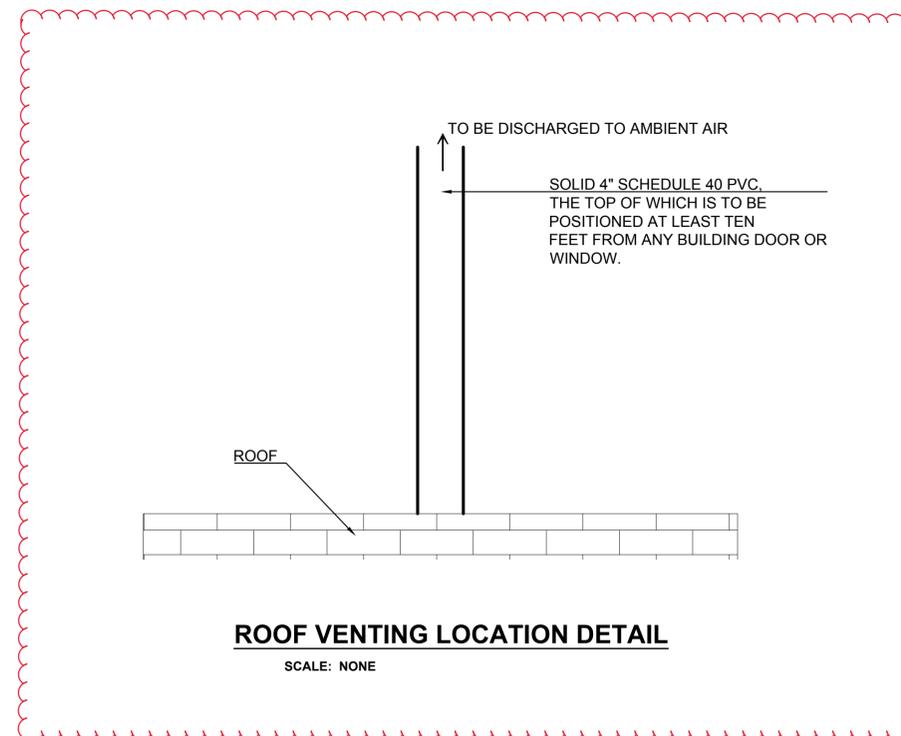
**CROSS SECTION OF SUB-SLAB SYSTEM**

SCALE: NONE



**SAMPLING PORT DETAIL**

SCALE: NONE



**ROOF VENTING LOCATION DETAIL**

SCALE: NONE

File name: L:\Projects\17000\17000-17798-000\DWG\Sheets\17798-000\_C03.dwg Layout Tab: C03 User: Jim Blanco CAD Plot Date/Time: 12/22/2020 10:17:11 AM

Full Size Sheet Format Is 22x34; If Printed Size Is Not 22x34, Then This Sheet Format Has Been Modified & Indicated Drawing Scale Is Not Accurate.

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**DETAILS FOR:**  
**BRIO LOFTS VAPOR MITIGATION SYSTEM**  
**177 N FAILING ST PORTLAND, OR 97227**



Know what's below.  
Call before you dig.



OREGON  
 NOV. 12, 2019  
 LANCE ALIN MOEN

EXPIRES: DECEMBER 31, 2020

DESIGNED:  
 KB  
 CHECKED:  
 NPW  
 NOV 2020  
 17798-000

SHEET ID  
**C03**

SHEET 3 OF 3

## Table 1. Vapor Barrier Alternatives Assessment

Brio Lofts  
177 N Failing Street, Portland, Oregon 97227

Vapor Barrier Type	Comments/Regulatory Acceptance <sup>1</sup>	Environmental Concerns	Unit Capital Cost (\$/ft <sup>2</sup> ) <sup>2</sup>	Total Capital Cost (\$)	Installation Difficulty	Confidence in Seal
Dual 20-mil liner <sup>3</sup>	Feasible for new construction. Typically combined with a subslab ventilation system. Easy maintenance with low environmental concerns. Permeance water vapor transmission rate (WVTR) is <0.1 perms (almost completely blocks vapors).	May not be chemically resistant	\$ 1.13	\$ 25,000	Moderate	Moderate
Single 40-mil liner	Feasible for new construction. Typically combined with a subslab ventilation system. Easy maintenance with low environmental concerns. Permeance (WVTR) is <0.1 perms (almost completely blocks vapors).	May not be chemically resistant	\$ 1.13	\$ 13,000	Moderate-Difficult	Moderate
Chemical-Specific Vapor Retardant/Absorptive Liner	Level B PPE required during installation. Installation may take multiple days to allow each layer to off-gas before the next one is applied. Spray-on membranes are difficult to repair. Permeance (WVTR) is <0.1 perms (almost completely blocks vapors).	Chemically resistant	\$ 6.00	\$ 66,000	Difficult	High

### Notes

1. Leak testing to be performed following installation of chosen vapor barrier in accordance with ASTM E-1186-03.
2. US EPA, Engineering Issue: Indoor Air Vapor Intrusion Mitigation Approaches
3. According to the US EPA, Engineering Issue: Indoor Air Vapor Intrusion Mitigation Approaches, the unit cost per square foot of 20-mil liner is approximately equivalent to that of a 40-mil liner; however, two layers of 20-mil liner are proposed to be applied. Costs are rounded to the nearest thousand dollars.

## Table 2. Sub-Slab Passive Soil Gas Collection System Piping Summary

Brio Lofts

177 N Failing Street, Portland, Oregon 97227

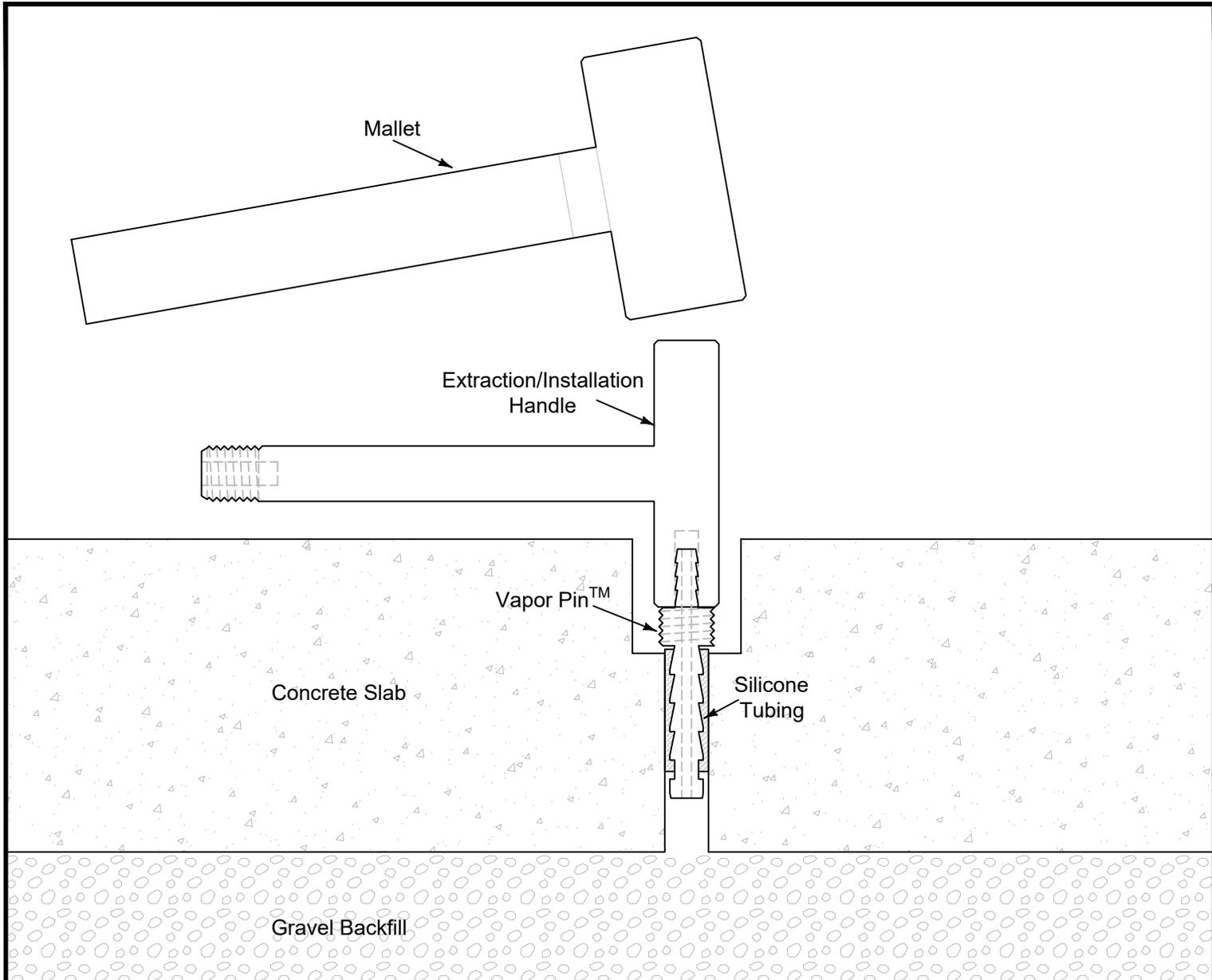
Piping Component	Quantity
4" perforated Schedule 40 PVC	450
4" solid Schedule 40 PVC	20
90-degree bend	10
end cap	4

### Table 3. Sampling And Expansion Port Component Summary

Brio Lofts

177 N Failing Street, Portland, Oregon 97227

Component	Product Link
<b>Sampling Port</b>	
PTFE thread seal tape	<a href="https://www.homedepot.com/p/1-2-in-x-520-in-Thread-Seal-Tape-31273/202206819">https://www.homedepot.com/p/1-2-in-x-520-in-Thread-Seal-Tape-31273/202206819</a>
1/2" FL x 1/2" lead-free brass flare union	<a href="https://www.homedepot.com/p/Everbilt-1-2-in-FL-x-1-2-in-MIP-Lead-Free-Brass-Flare-Union-801429/207176527">https://www.homedepot.com/p/Everbilt-1-2-in-FL-x-1-2-in-MIP-Lead-Free-Brass-Flare-Union-801429/207176527</a>
1/2" Lead-free brass threaded fptxfpt ball valve	<a href="https://www.homedepot.com/p/Everbilt-1-2-in-Lead-Free-Brass-Threaded-FPT-x-FPT-Ball-Valve-116-2-12-EB/205817916">https://www.homedepot.com/p/Everbilt-1-2-in-Lead-Free-Brass-Threaded-FPT-x-FPT-Ball-Valve-116-2-12-EB/205817916</a>
Lead-free brass hose barb adapter 3/8" x 1/2" MIP	<a href="https://www.homedepot.com/p/Everbilt-Lead-Free-Brass-Hose-Barb-Adapter-3-8-in-x-1-2-in-MIP-800179/300095960">https://www.homedepot.com/p/Everbilt-Lead-Free-Brass-Hose-Barb-Adapter-3-8-in-x-1-2-in-MIP-800179/300095960</a>
<b>Expansion Port</b>	
4" PVC 45-Degree Hub x Hub x Hub Wye	<a href="https://www.homedepot.com/p/NDS-4-in-PVC-45-Degree-Hub-x-Hub-x-Hub-Wye-4P08/100164403">https://www.homedepot.com/p/NDS-4-in-PVC-45-Degree-Hub-x-Hub-x-Hub-Wye-4P08/100164403</a>
4" PVC DWV Hub Cap	<a href="https://www.homedepot.com/p/NDS-4-in-PVC-45-Degree-Hub-x-Hub-x-Hub-Wye-4P08/100164403">https://www.homedepot.com/p/NDS-4-in-PVC-45-Degree-Hub-x-Hub-x-Hub-Wye-4P08/100164403</a>

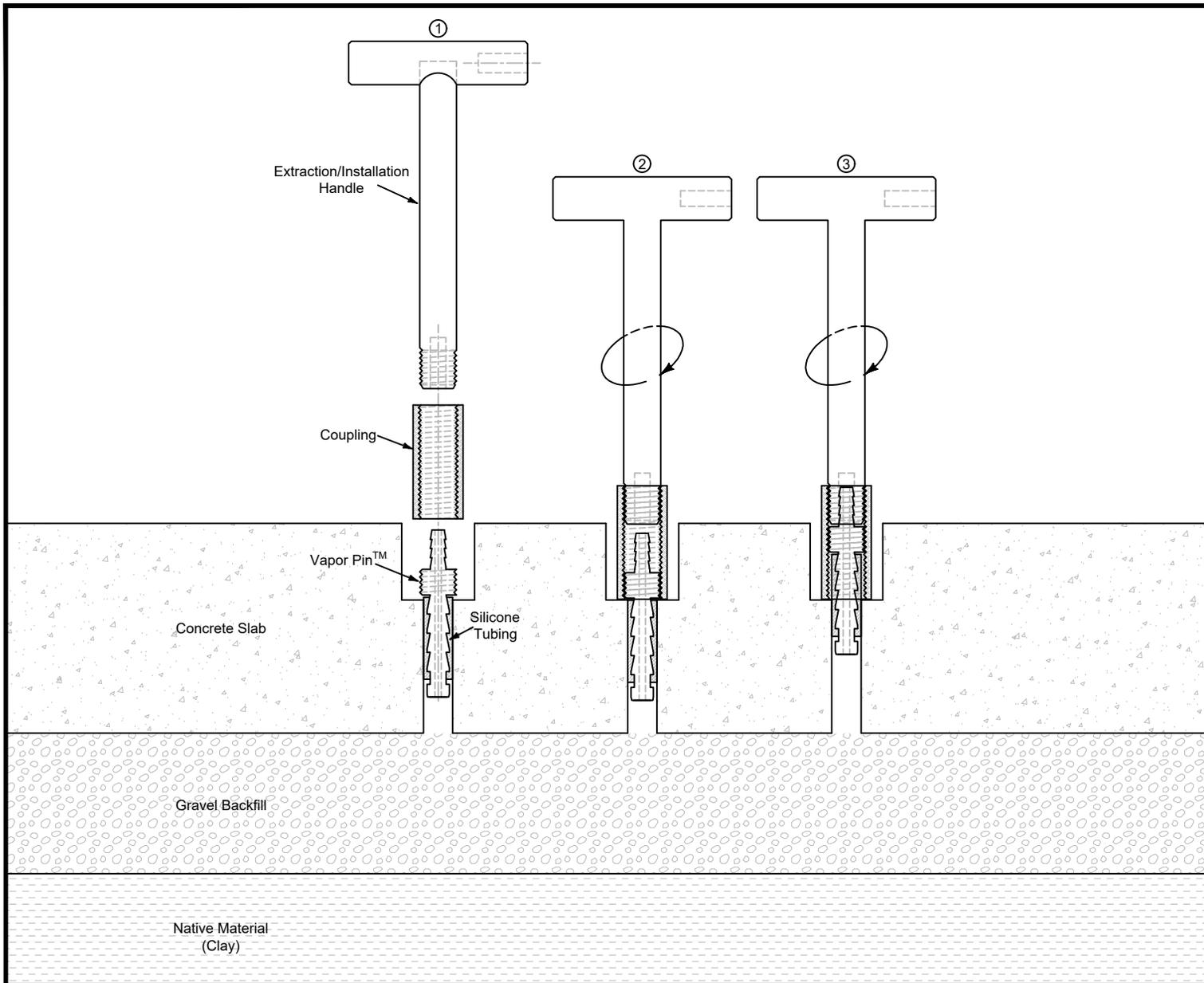


<u>Legend</u>	



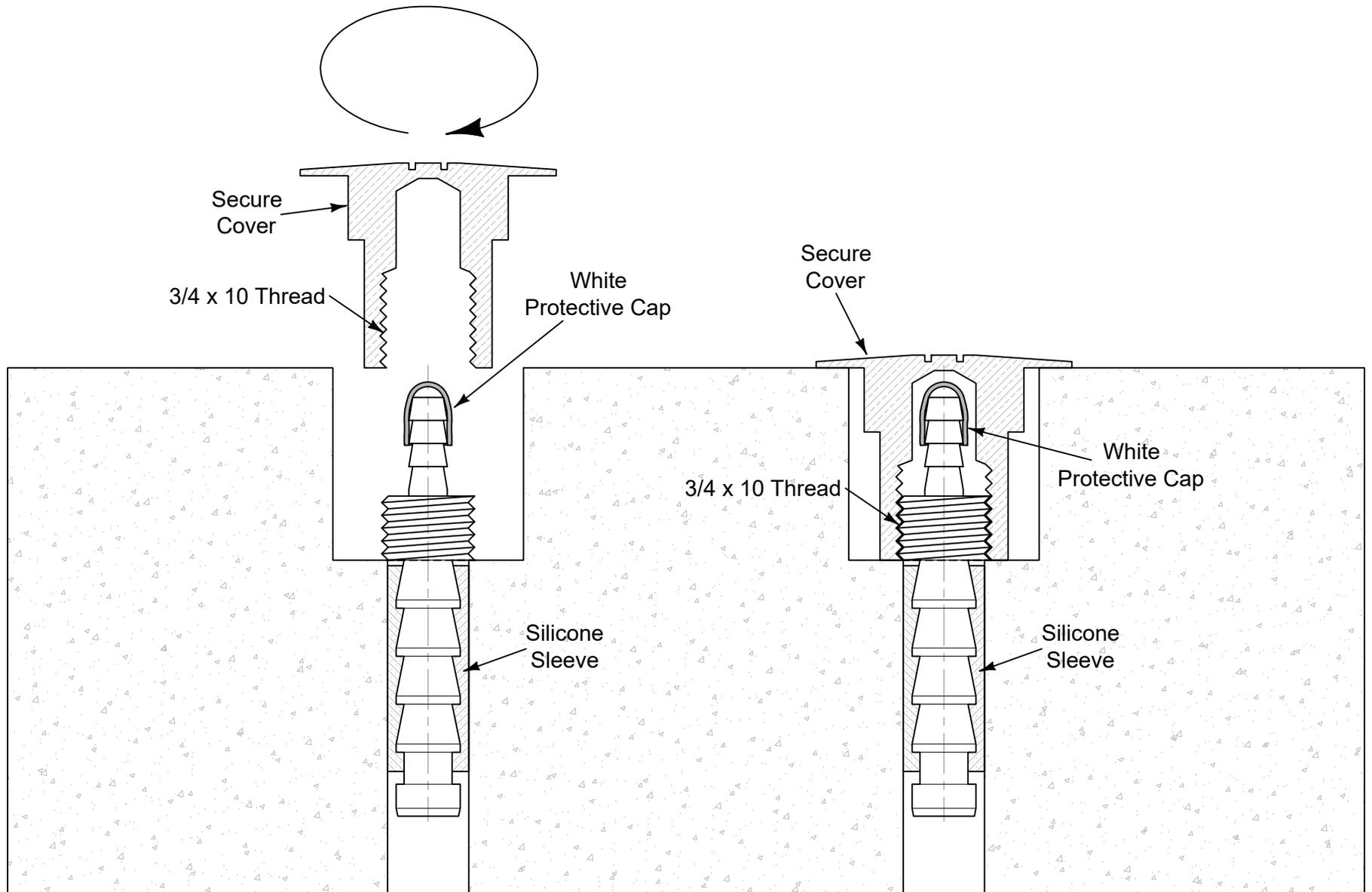
Vapor Pin® Installation,  
 Vapor Pin Enterprises, Inc.  
 January 4, 2010

Figure  
 1



### Legend

- ① Vapor Pin™ Extraction/Installation Tool Components
- ② Vapor Pin™ Extraction/Installation Tool Engaged
- ③ Vapor Pin™ Assisted Extraction Complete



# ABSOLUTE BARRIER® Y40BAC

HIGH PERFORMANCE LLDPE/EVOH GEOMEMBRANE GAS BARRIER

RAVEN

## PRODUCT DESCRIPTION

Absolute Barrier® Y40BAC is a seven-layer co-extruded geomembrane consisting of very flexible, linear-low-density polyethylene (LLDPE) with an inner core of chemically resistant EVOH barrier resin, designed specifically as a barrier against radon, methane and VOCs. High strength LLDPE provides exceptional tear and impact resistance. A robust stabilization package that exceeds the industry standard; provides long-term protection from thermal oxidation and ultraviolet degradation in exposed applications.

## PRODUCT USE

Absolute Barrier® Y-Series is designed to stop gas vapor migration on Brownfield sites, in residential and commercial buildings, as well as geomembrane containment and covering systems. When installed under concrete slabs as a gas barrier, a passive system is recommended to include a ventilated system with sump(s) that could be converted to an active control system with properly designed ventilation fans. Y40BAC is over 800 times less permeable to methane gas than LLDPE vapor barriers in a comparable thickness.

Absolute Barrier® performs extremely well preventing the degradation of EPS geofoam by protecting it from harsh VOCs including direct gasoline or diesel fuel contact.

Absolute Barrier® Y40BAC is a highly effective, interim and long-term buried landfill caps with VOC diffusion coefficients ranging from 50 to 200 times less than standard 80 mil HDPE geomembranes. Contaminants found in leachate and gas in municipal and hazardous waste landfills can migrate through standard HDPE; contributing to both atmospheric and groundwater contaminations. Absolute Barrier® Y-Series is an effective barrier to a wide range of VOCs including benzene, toluene, trichloroethylene, perchloroethylene, and many others.

## SIZE & PACKAGING

Absolute Barrier® Y40BAC is available in 16' c-fold mill rolls or in large one-piece fabricated panels up to 38,000 sq. ft. All fabricated panels are accordion folded and tightly rolled onto a heavy-duty core for ease of handling and time saving installation.



EPS Geofoam Protection

## PRODUCT

## PART #

ABSOLUTE BARRIER® ..... Y40BAC

## APPLICATIONS

EPS Geofoam Protection	Underslab Methane Barrier
Buried Landfill Cap	Underslab Vapor Barrier
Temporary Landfill Gas Cover	Remediation Cover / Liner
Floating Gas Cover	Leachate Collection Ponds
Underslab VOC Barrier	Odor Control Barrier
Underslab Radon Barrier	Secondary Containment

**Absolute Barrier®**  
THE ULTIMATE IN GAS CONTAINMENT

# ABSOLUTE BARRIER® Y40BAC

HIGH PERFORMANCE LLDPE/EVOH GEOMEMBRANE GAS BARRIER

		ABSOLUTE BARRIER® Y40BAC			
		IMPERIAL		METRIC	
PROPERTIES	TEST METHOD	MINIMUM	TYPICAL	MINIMUM	TYPICAL
APPEARANCE		Black		Black	
THICKNESS	ASTM D5199	40 Mils Average	40 Mils Nominal	1.02 mm Average	1.02 mm Nominal
WEIGHT		205 lbs/msf		1001 g/m <sup>2</sup>	
TENSILE STRENGTH	ASTM D6693	125 lbs/in	140 lbs/in	219 N/cm	245 N/cm
TENSILE ELONGATION AT BREAK	ASTM D6693	550 %	650 %	550 %	650 %
TEAR STRENGTH	ASTM D1004	22 lbs	27 lbs	98 N	120 N
PUNCTURE RESISTANCE	ASTM D4833	70 lbs	90 lbs	311 N	400 N
OXIDATION INDUCTION TIME (OIT) OR HIGH PRESSURE OIT (HPOIT)	ASTM D3895 ASTM D5885	100 min 400 min	250 min -	100 min 400 min	250 min -
CARBON BLACK CONTENT <sup>7</sup>	ASTM D4218	2.0 %	2.3 %	2.0 %	2.3 %
CARBON BLACK DISPERSION	ASTM D5596	Pass			
BENZENE PERMEANCE	See Note <sup>6</sup>	2.27 x 10 <sup>-10</sup> m <sup>2</sup> /sec or 1.81 x 10 <sup>-13</sup> m/s			
TOLUENE PERMEANCE	See Note <sup>6</sup>	3.15 x 10 <sup>-10</sup> m <sup>2</sup> /sec or 7.28 x 10 <sup>-14</sup> m/s			
ETHYLBENZENE PERMEANCE	See Note <sup>6</sup>	2.47 x 10 <sup>-10</sup> m <sup>2</sup> /sec or 1.67 x 10 <sup>-14</sup> m/s			
M & P-XYLENES PERMEANCE	See Note <sup>6</sup>	2.33 x 10 <sup>-10</sup> m <sup>2</sup> /sec or 1.91 x 10 <sup>-14</sup> m/s			
O-XYLENE PERMEANCE	See Note <sup>6</sup>	2.20 x 10 <sup>-10</sup> m <sup>2</sup> /sec or 1.71 x 10 <sup>-14</sup> m/s			
METHANE PERMEANCE	ASTM D1434	< 3.70E <sup>-13</sup> m/s			
HYDROGEN SULFIDE	See Note <sup>9</sup>	1.09E <sup>-09</sup> m/s			
TRICHLOROETHYLENE (TCE)	See Note <sup>6</sup>	1.53 x 10 <sup>-10</sup> m <sup>2</sup> /sec or 5.25 x 10 <sup>-15</sup> m/s			
PERCHLOROETHYLENE (PCE)	See Note <sup>6</sup>	1.44 x 10 <sup>-10</sup> m <sup>2</sup> /sec or 5.22 x 10 <sup>-15</sup> m/s			
COLD TEMPERATURE IMPACT	ASTM D746	-40° F		-40° C	
MAXIMUM STATIC USE TEMPERATURE		180° F		82° C	

## FACTORY SEAM REQUIREMENTS

BONDED SEAM STRENGTH	ASTM D6392 Mod. <sup>5</sup>	80 lbs/in	90 lbs/in	140 N/cm	158 N/cm
SEAM PEEL ADHESION	ASTM D6392 Mod. <sup>5</sup>	60 lbs/in	70 lbs/in	105 N/cm	123 N/cm

<sup>5</sup> Raven Industries performs seam testing at 20" per minute.

<sup>6</sup> Aqueous Phase Film Permeance.

Permeation of Volatile Organic Compounds through EVOH Thin Film Membranes and Coextruded LLDPE/EVOH/LLDPE Geomembranes, McWatters and Rowe, Journal of Geotechnical and Geoenvironmental Engineering© ASCE/September 2015. (Permeation is the Permeation Coefficient adjusted to actual film thickness - calculated at 1 kg/m<sup>3</sup>). The study used to determine PCE and TCE is titled: Evaluation of diffusion of PCE & TCE through high performance geomembranes by Di Battista and Rowe, Queens University 8 Feb 2018.

<sup>7</sup> No carbon black in barrier layers.

<sup>9</sup> The study used to determine diffusion coefficients is titled: Hydrogen Sulfide (H<sub>2</sub>S) Transport through Simulated Interim Covers with Conventional and Co-Extruded Ethylene-Vinyl Alcohol (EVOH) Geomembranes.

Absolute Barrier® Y40BAC is a seven-layer co-extruded geomembrane consisting of very flexible, linear-low-density polyethylene (LLDPE) with an inner core of chemically resistant EVOH barrier resin, designed specifically as a barrier against radon, methane and VOCs. High strength LLDPE provides exceptional tear and impact resistance. A robust stabilization package that exceeds the industry standard; provides long-term protection from thermal oxidation and ultraviolet degradation in exposed applications.



Scan QR Code to download technical data sheets.

Note: To the best of our knowledge, unless otherwise stated, these are typical property values and are intended as guides only, not as specification limits. Chemical resistance, odor transmission, longevity as well as other performance criteria is not implied or given and actual testing must be performed for applicability in specific applications and/or conditions. RAVEN INDUSTRIES MAKES NO WARRANTIES AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for resulting loss or damage. Limited Warranty available at [www.ravenefd.com](http://www.ravenefd.com)

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## **APPENDIX G**

### **OMMP**

Mr. Robert Hood  
Oregon Department of Environmental Quality  
700 NE Multnomah St., Suite #600  
Portland, Oregon 97232

Thursday, August 12, 2021

**RE: Operations, Maintenance and Monitoring Plan**  
**Brio Lofts – ECSI Facility #6219**  
**3912 N Vancouver Avenue**  
**Portland, Oregon 97227**

Mr. Hood,

Point Source Solutions (Point Source) is pleased to submit this OMMP for Brio Lofts located at 3912 N Vancouver Avenue in Portland, Oregon (Site). This OMMP describes operational/maintenance procedures and the monitoring scope and schedule to monitor sub-slab vapor conditions and verify that the conditions are and remain protective of human health. Specifically, this OMMP presents the following:

- General description of the passive ventilation system beneath the sub-slab vapor barrier, including two sub-slab monitoring probes;
- Monitoring requirements and frequency;
- Monitoring scope and methods;
- Specific chemical analyses and quantitative methods to be used;
- Inspection and maintenance plan;
- Contingency measures (if needed).

The Site is identified on a Site Location Map (Figure 1), Topographic Map (Figure 2), and Sub-Slab Monitoring Probe Locations Map (Figure 4), all of which are located in the Figures attached to this plan.

**BACKGROUND**

From 2014 to 2017, environmental investigations identified the presence of petroleum contaminated soils (PCS) and multiple underground storage tanks (USTs) throughout the Site from past activities associated with a former service station and auto repair business located on the Site from 1936 through 1964. The investigations and resulting cleanup reports prepared by Point Source Solutions LLC (Point Source) are summarized as follows:

- Environmental Subsurface Investigation, Portland, Oregon dated July 8, 2014 prepared by Point Source Solutions LLC. Project #OR140603-6;
- Underground Storage Tank Closure and Soil Cleanup Report, LUST Facility #26-14-1732, Portland, Oregon dated February 23, 2015 prepared by Point Source Solutions LLC. Project #OR141117-3;
- Subsurface Environmental Investigation, Portland, Oregon dated August 8, 2017 prepared by Point Source Solutions LLC. Project #OR170712-3;

In 2014 NRC Environmental Services (NRC) with oversight by Point Source decommissioned by removal 3 USTs and a hydraulic hoist. PCS was encountered, then excavated with a total of 23.99 tons being transported to the Waste Management Hillsboro Subtitle D Landfill.

In August 2017, an additional investigation was conducted to assess the extent of PCS encountered during a geotechnical boring advanced in June 2017 in the southwest portion of the Property. The August investigation found PCS at depths ranging from 9 to 50 feet bgs and identified areas in the southwest portion of the Property where both gasoline and naphthalene exceeded the ODEQ screening level for the Vapor Intrusion into Buildings pathway for urban residential development.

Following a review of the August 2017 environmental investigation, ODEQ Project Manager Robert Hood requested the collection of additional soil-gas samples on the Site, and on south and west adjoining properties where residential development was present. The resulting reports are summarized as follows:

- Soil Gas Vapor Testing Results, Memorandum, dated April 21, 2018 prepared by Point Source Solutions LLC.
- ESCI File #6219, Memorandum, dated April 17, 2018 prepared by Point Source Solutions LLC.

The soil gas testing identified gasoline-range hydrocarbons and volatile organic compounds (vinyl chloride, chloroform, benzene, trichloroethene, tetrachloroethene, ethylbenzene and naphthalene) in and immediately outside the impacted soil plume at concentrations that exceed the ODEQ screening level for the Vapor Intrusion into Buildings pathway for urban residential receptors. The plume appeared to be confined to the Site and contaminants of interest did not exceed the ODEQ Vapor Intrusion into Buildings for residential receptors in samples on west and south adjoining properties.

In addition to the soil gas testing results, ODEQ was provided with a memorandum explaining the then current understanding of the gasoline plume at the Site, while also summarizing Point Source's proposed remedial action plan for the redevelopment of the Site, which was anticipated to be a multi-story mixed-use "urban residential" structure with subgrade parking.

In support of remedial efforts, Point Source recommended the removal of PCS to a minimum depth of 18 feet bgs, which was expected to result in a significant reduction in the mass of highly impacted soils, and create a buffer of clean compacted materials between the impacted soil plume and the base of the proposed development. Also included was the recommendation for installation of a passive vapor mitigation system with a 40 mil vapor barrier.

Point Source was contracted to oversee all remedial activities for the purpose of achieving regulatory closure with respect to ECSI File No. 6219 identified as 3902 N Vancouver Avenue and to provide oversight for the removal of all PCS encountered during redevelopment activities. PBS Engineering & Environmental Inc (PBS) was contracted to design the passive vapor mitigation system.

In December 2018, Point Source was informed of two additional USTs encountered during Site redevelopment in the southwest portion of the Property. One located under the city sidewalk right-of-way (ROW) parallel to NE Failing Street, and the other located 2 feet north within the Property boundaries. The tanks were 3.8 in diameter and 12 feet in length, both with a rated volume of 1,000 gallons. Both tanks were buried 4 feet below ground surface.

Prior to decommissioning activities, Point Source obtained PBOT ROW UST Decommissioning Permit # TR-18-134 and Portland Fire & Rescue Permit # 19-100223000-00-FS.

On January 9, 2019, Point Source oversaw decommissioning activities by NRC. The top of the tanks were exposed and accessed, and the interiors were tested with a Combustible Gas Indicator (CGI), and confirmed safe to cut open. NRC removed approximately 350 gallons of water from one tank and approximately 200 gallons of water from the second tank. No product was found in either tank. Following the removal of liquids, NRC rinsed

the interior of each tank. A sample of the tank water was collected and submitted for waste characterization.

On January 11, 2019, both tanks were removed from the ground and transported off-site for recycling as scrap. Further excavation was put on hold until the surrounding grade was reduced, and perimeter shoring was started.

In January 2019, Point Source provided construction observation and media management services starting with the oversight of pile driving for the perimeter shoring by DeWitt Construction Inc (DeWitt) which, based on the previous investigations, was expected to encounter PCS in the southwest portion of the Site. Between January 7 and 17, 2019, Point Source oversaw the installation of 24 piles to a depth of 35 feet bgs. Point Source observed and documented 9 of the 24 piles to have encountered PCS at depths ranging from 20-35 feet bgs, all in the vicinity of the southwest portion of the Site. All contaminated soil generated during pile driving activity was transported to the Waste Management Hillsboro Subtitle D Landfill for disposal under profile # 129414OR.

In February 2019, Point Source oversaw the removal of soils during the construction of the shoring retention system in which the overall site grade was brought down 15-20 feet bgs to accommodate the subgrade parking garage. PCS was encountered in the southwest portion as well as in the vicinity of the original UST excavation from 2014. Excavation continued on an as needed basis for the remainder of the shoring process. All contaminated soil was transported to the Waste Management Hillsboro Subtitle D Landfill for disposal under profile # 129414OR.

In total, remedial actions overseen by Point Source in January and February 2019 resulted in the removal and disposal of 441.7 tons of impacted soil.

In June 2019, Point Source observed installation procedures of the Raven Industries Absolute 40 mil Barrier approved by ODEQ. Point Source, with a representative from Raven Industries, confirmed the proper installation to manufacturer recommendations. On June 7, 2019, Nathan Williams, PE with PBS performed smoke testing to detect any tears or holes in the barrier. No impairments to the barrier were noted.

### **OMMP ORGANIZATION**

This OMMP includes a description of the ODEQ-required performance testing (related to the passive vapor mitigation system) to monitor sub-slab vapors beneath the subgrade parking structure of the Site building. The duration of the monitoring activities described in this OMMP are based on the assumption that the conditions will remain protective throughout the planned monitoring period. Our scope of services associated with this testing were developed based on correspondence with Robert Hood of ODEQ. Additionally, this Plan includes inspection/maintenance procedures.

Although not anticipated to require implementation, this OMMP also includes contingency responses/asures to address conditions should they prove not protective. Such actions would be subject to further discussion and work planning through correspondence with the Property Owner, ODEQ, and Point Source prior to implementation.

Finally, this OMMP includes proposed reporting requirements and reporting schedules for each monitoring, inspection, and maintenance period. The Property Owner must notify ODEQ prior to implementing any activities that may impact the integrity of the sub-slab ventilation system.

### **DESCRIPTION OF PASSIVE VENTILATION SYSTEM**

The passive vapor mitigation system includes a sub-slab vapor barrier that incorporates a passive ventilation

system (that can be upgraded to an active system, if necessary) beneath the barrier layer, within the aggregate located beneath the floor slab. The sub-slab system is designed to mitigate potential vapor risks, including VOCs originating from historically impacted soil.

#### ***SUB-SLAB VAPOR BARRIER AND VENTILATION SYSTEM***

A sub-slab vapor barrier was installed beneath the footprint of the Site building to mitigate potential vapor impacts to residential tenant spaces. The sub-slab vapor barrier consists of a 40-mil thick liner of Absolute Barrier® Y40BAC manufactured by Raven Industries. Absolute Barrier® is a seven-layer co-extruded geomembrane consisting of flexible, linear low density polyethylene (LLDPE) with an inner layer of chemically resistant EVOH barrier resin designed specifically for protection from radon, methane and VOCs.

The vapor barrier system incorporates a passive ventilation system, including perforated horizontal pipes nested in aggregate beneath the barrier layer, which is covered with an aggregate layer located beneath the floor slab. The ventilation pipe is connected to a vertical PVC vent riser that exits through the roof and is equipped with rotary turbine caps. The rotary turbine cap passively discharges vapors to the atmosphere at least 12 inches above the roof line. If required, the passive system can be upgraded to an "active" system by fitting the vent riser pipes with an in-line fan to induce vacuum pressure within the sub-slab vent line. Valved access ports could also be installed to facilitate measurements and sample collection on the intake and discharge sides of the ventilation fans, if required.

#### ***SUB-SLAB MONITORING POINTS***

Two sub-slab monitoring probes are located in the sub-grade parking level floor of the Site building to evaluate sub-slab vapor conditions. These sub-slab monitoring probes can also be monitored in the future, if appropriate, to evaluate the overall effectiveness of an active fan system, should the need arise to upgrade the current passive system. Monitoring probe locations are shown on Figure 4. The monitoring probes were installed in general accordance with PBS design specifications and ODEQ guidance and are intended to facilitate routine monitoring for gasoline-range hydrocarbons and VOCs. Each sub-slab monitoring probe consists of a stainless steel Vapor Pin® Sampling Device installed in the parking garage floor and terminated in the sub-slab aggregate base material placed over the 40 mil vapor barrier and covered by a Vapor Pin® Secure Cover placed in the parking garage floor.

The probes are fitted with a threaded sample port to facilitate sampling and measurements. Each monitoring point assembly is sealed to inhibit ambient air intrusion into the intake zone. Sub-slab monitoring probe details are shown on Figure 3.

### **MONITORING SCHEDULE**

#### ***BASELINE MONITORING***

A baseline monitoring event was completed on January 20, 2021. The purpose of this event was to confirm that vapor concentrations were compliant with applicable RBCs and that the installed system was working as designed.

Vapor samples were transported under chain of custody to Friedman and Bruya of Seattle, Washington. Each sample was labeled for identification, and Chain of Custody was maintained for all samples. The samples were analyzed for gasoline range hydrocarbons and select VOCs (common gasoline constituents) by EPA TO-17.

TABLE 1 – SUMMARY OF SOIL-VAPOR SAMPLE RESULTS IN UG/M <sup>3</sup>			
Sample ID	Location	Gx/VOCs by Method TO-17	2-Propanol (leak detector)
PS1	Vent Riser	<b>1,1,1 Trichloroethene – 6.4</b> <b>Benzene - 40</b> <b>Trichloroethene – 4.0</b> <b>Toluene – 8.5</b> <b>Tetrachloroethene – 7.0</b> <b>124-TMB – 2.6</b> <b>Gx – &lt;2500</b>	<250
SS1	Sub-slab Sampling Port – SW Corner Parking Garage	<b>Trichloroethene – 1.3</b> <b>Toluene – 7.4</b> <b>Tetrachloroethene – 4.1</b> <b>124-TMB – 3.1</b> <b>Gx – &lt;2500</b>	<250
SS2	Sub-slab Sampling Port – Centrally Located Eastside Elevator Shaft Parking Garage	<b>1,1,1 Trichloroethene – 10</b> <b>Trichloroethene – 8.6</b> <b>Toluene – 7.7</b> <b>Tetrachloroethene – 30</b> <b>124-TMB – 3.6</b> <b>Gx – &lt;2500</b>	<250
<b>ODEQ Soil Gas Inhalation RBC - Residential</b>		<b>1,1,1 Trichloroethene – 1,000,000</b> <b>Benzene - 72</b> <b>Trichloroethene – 95</b> <b>Toluene – 1,000,000</b> <b>Tetrachloroethene – 2,200</b> <b>124-TMB – 13,000</b> <b>Gx – 79,000</b>	<b>No Value</b>

Table 1 Notes:

VOCs not listed were not detected and/or are not listed on the ODEQ RBCA Table (ODEQ, May 2018).

**Bold** indicates compounds exceeding 1 or more regulatory screening levels.

2-Propanol was used as a sample breakthrough compound. Concentrations of less than 5% (500,000 ug/m3) are acceptable.

Copies of the laboratory analytical reports are provided in Appendix C.

Laboratory QA/QC measures were performed through data validation of available analytical data generated as part of these sampling events. Data validation considered the following:

- Method Detection and/or Reporting Limits
- Laboratory Matrix Blanks
- Sample Holding Times
- Surrogate and Matrix Spike Recoveries, and
- Laboratory Duplicate Analysis Results

Friedman & Bruya did not report qualifiers that would indicate problems with the sample results. According to the lab reports all analyses were performed with the appropriate Batch QC (including Sample Duplicates, Matrix Spikes and/or Matrix Spike Duplicates) in order to meet or exceed method and regulatory

requirements. Exceptions are qualified in the analytical report. In cases where there is insufficient sample material provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) is analyzed to demonstrate accuracy and precision of the extraction and analysis. 2-Propanol was used as a leak check compound for the soil vapor samples. 2-Propanol was not detected or was detected at very low concentrations, indicating that the VOC sample results are valid.

**Concentrations of gasoline-range hydrocarbons and VOCs in vapor samples collected from the system vent riser and the two sub-slab sampling ports for the Baseline Monitoring Event were below the ODEQ Soil Gas Inhalation RBC for residential receptors.**

### ***PERFORMANCE MONITORING***

Performance monitoring will occur on a semi-annual basis for the first 1.5 years of passive system operation. The first performance monitoring event will occur approximately six months following the baseline monitoring event (anticipated June 2021). The second performance monitoring event will occur approximately six months following the first performance monitoring event (anticipated December 2021) and the third six months later (anticipated June 2022). Performance monitoring is intended to evaluate passive system performance and the need for contingency measures.

If the results of the three performance monitoring events are consistent with the baseline monitoring event and/or demonstrate that contaminant concentrations within sub-slab vapor are less than applicable ODEQ RBCs for soil gas, Point Source will request that ODEQ release the requirement for future monitoring of the vapor barrier/ventilation system. Upon release from ODEQ for future monitoring, the passive system will remain in operation.

### **MONITORING SCOPE AND METHODS**

Routine monitoring of sub-slab conditions are proposed to verify that conditions are and remain protective. The following sections present detailed methods to be employed for the monitoring events described above.

#### ***BASELINE MONITORING***

The January 2021 Baseline Monitoring Event included the following activities at each of the two sub-slab monitoring probes:

- Completed a visual inspection of the vent riser and sub-slab monitoring probe components for overall condition in accordance with engineering specifications.
- At each monitoring probe, VOC vapor readings collected with a Photoionization Detector (PID) were recorded.
- Collected sub-slab vapor samples from each sub-slab monitoring probe. Sub-slab vapor sampling from each monitoring probe was conducted as follows:
  - Connected a length of disposable Teflon™ tubing to the Vapor Pin® threaded fitting and routed to a sampling assembly. The sampling assembly included a calibrated handheld SKC® Pocket Pump Touch to induce a vacuum to maintain a sampling flow at 100 ml/min, and sorbent sampling tubes. All connections were made with Swagelok fittings.
  - Purged the sub-slab monitoring probes of at least 2 dead-air space volumes (a minimum of 3-minutes) from within the intake assembly, tubing, and manifold. Purging was accomplished using

the SKC® Pocket Pump Touch incorporated into the sampling assembly. Upon achieving sufficient purge volume, the purging was discontinued.

- Performed leak-detection by soaking rags with isopropyl alcohol and installation of a temporary water dam; the rags were placed over the sampling fitting and connection points within the sampling manifold.
- Samples were collected with sorbent tubes with a collected vapor sample volume of 1 liter.
- Submitted the sub-slab vapor samples to an analytical laboratory under standard chain-of-custody procedures for analysis of gasoline-range hydrocarbons and VOCs by EPA Method T0-17.
- A discharge vapor sample was collected from the vertical vent riser using a sorbent tube. The discharge sample was submitted to an analytical laboratory for analysis of gasoline-range hydrocarbons and VOCs by EPA Method T0-17.

### **PERFORMANCE MONITORING**

Performance monitoring will include the following activities at each of the two sub-slab monitoring probes:

- Complete a visual inspection of the vent riser and each sub-slab monitoring probe for overall condition in accordance with engineering specifications.
- At each monitoring probe, record ambient and sub-slab pressures, VOC vapor readings, and temperatures using magnehelic differential pressure/vacuum gauges, a PID, and field temperature gauges, respectively.
- Collect sub-slab vapor samples from each sub-slab monitoring probe. Sub-slab vapor sampling from each monitoring probe will be conducted as follows:
  - Connect a length of disposable Teflon™ tubing to the monitoring point threaded fitting and routed to a sampling manifold assembly. The sampling manifold will include a handheld instrument to induce a vacuum and maintain a sampling flow at 100 ml/min and a sorbent sampling tube. All connections will be made with Swagelok fittings.
  - Purge the sub-slab monitoring probes of at least 2 dead-air space volumes (a minimum of 3-minutes) from within the intake assembly, tubing, and manifold. Purging will be accomplished using a handheld instrument to induce a vacuum incorporated into the sampling assembly. Upon achieving sufficient purge volume, the purging will be discontinued.
  - Perform leak-detection by soaking rags with isopropyl alcohol and the installation of a temporary water dam; the rags will be placed over the sampling fitting and connection points within the sampling manifold.
  - Samples will be collected with a laboratory-provided summa canister, attaching the summa canister to a flow regulated sampling manifold and collect a sample by drawing between 1 to 6 liters of sample into the canister (to ensure low reporting limits), which is then returned to the laboratory.
  - A discharge vapor sample will also be collected from the vertical vent riser. This sample will be collected using a summa canister. The discharge samples will be submitted to an analytical laboratory for analysis of gasoline-range hydrocarbons and VOCs by EPA Method T0-15.

## **INSPECTION AND MAINTENANCE PLAN**

Site checks and associated maintenance for the current engineering controls will be performed periodically by the Property Owner. Typical monitoring and maintenance actions include the following:

- Verifying acceptable condition and operation of the sub-slab ventilation system, particularly the vent riser assemblies and rotary/turbine caps.
- Routine general inspections of the lower level floor slab integrity (as practicable without destructive methods).
- Ensuring invasive activities that penetrate the lower level floor slab are limited.

Maintenance site checks (inspections) will occur semiannually for the first year after completion of all design elements to evaluate performance during each season (anticipated in January and July 2022).

Additional inspections beyond the planned events will be made if the Property Owner observes significant movement of the lower level slab, or if requested by ODEQ. Additional inspections will also occur if local seismic events of magnitude 6.0 or greater are recorded or flooding occurs that exceeds the 100-year flood magnitude. Inspections associated with these events will continue in perpetuity.

If the Property Owner's designee establishes through the inspection and maintenance program that engineering controls do not meet design requirements or no longer function as designed, contingency measures will be implemented (described below). For any element that the Inspector determines is not functioning as designed, the Inspector will communicate the observation to the Property Owner and Point Source. Point Source will communicate with ODEQ regarding any substantial performance issues. If required, significant repair measures will be discussed with DEQ and, if warranted, a brief work plan will be submitted to ODEQ for approval prior to completing the repair. Following DEQ's concurrence or approval, repairs to the identified elements will begin as soon as possible.

The goal of any repair is to restore the engineering control to its original design. If recurring repairs or problems are observed, design improvements may be collectively discussed with the property owner/manager, Point Source, and ODEQ to identify appropriate corrective measures.

Any future invasive activities that may compromise the integrity of the engineering controls (i.e., any activity that penetrates or otherwise compromises a portion of the ground level floor slab and vapor barrier/passive vapor ventilation system) will trigger special planning, coordination, and documentation.

If future invasive activities are required beneath any portion of the ground level floor slab or any area/depth as documented to exhibit potential contamination, soil associated with those activities shall be managed in accordance with a Contaminated Media Management Plan (CMMP). Excavation contractors should review the CMMP prior to conducting soil-disturbing activities. When soil disturbing activities are completed, the associated cover materials (i.e., concrete, asphalt, or landscaping) shall be restored to their original condition as soon as possible.

Future invasive activities that may penetrate or otherwise compromise the integrity of the sub-slab vapor barrier and ventilation system must include a plan to restore the respective components to their original condition. Only qualified contractors that are certified by Raven Industries to complete and verify repairs to the engineered vapor barrier system can be used. These repairs shall be made to the satisfaction of the design engineer and/or ODEQ, or their designee. Following any confirmation sampling, soil-disturbing activities, and barrier repairs, a memorandum report will be submitted to ODEQ within 30 days.

## **CONTINGENCY MEASURES**

Based on our understanding of current subsurface conditions, the presence of site contaminants within sub-slab (or extracted) vapor at concentrations exceeding ODEQ soil gas RBCs is considered unlikely in the future. The purpose of implementing the monitoring plan is to provide verification and continued assessment of conditions over time, verify that conditions remain protective throughout the monitoring period, and support potential contingency responses as detailed in this section.

Sub-slab vapor sampling analytical results will be compared to ODEQ generic RBCs for soil gas. If VOCs are detected at concentrations equal to or greater than the applicable RBCs, the property owner/manager and ODEQ will be notified. However, the presence of site-related VOCs in sub-slab vapor near, at, or greater than respective RBCs does not necessarily correlate to indoor air risks. This is because the passive ventilation system operates continuously, thereby providing a preferential route for VOCs to be removed from the sub-slab zone and the impermeable membrane is designed to inhibit migration of contaminants into the building spaces. However, if VOCs are consistently detected at concentrations equal to or greater than the applicable RBCs during the performance monitoring, or the concentrations demonstrate an increasing trend during performance monitoring, appropriate parties (the property owner/manager and ODEQ) will be notified and the monitoring scope and schedule may be modified and/or extended to provide a more robust analysis of sub-slab conditions. If these conditions are encountered, a careful evaluation will be made to assess the potential for accelerated capture or migration of VOCs toward interior spaces. If necessary, modifications to the monitoring scope and schedule will be documented through an addendum to this OMMP.

If a more robust monitoring scope and schedule confirm that conditions may not be protective to human health, additional contingency measures may be implemented. The first contingency measure that may be considered for implementation will be the installation of an in-line ventilation fan. In the event that an in-line fan is installed and activated, monitoring of the sub-slab probes and ventilation system will be conducted in accordance with the "Baseline Monitoring" section, followed by three consecutive quarters of monitoring in accordance with the "Performance Monitoring" section of this Plan. In addition, one discharge vapor sample will also be collected from the vertical vent riser. Data compiled from the performance monitoring period will be used to evaluate the effectiveness of the activated fan.

If sub-slab vapor concentrations increase in the future, and are not adequately mitigated through operation and/or modification of the active ventilation system, additional action can be implemented if warranted. Such responses, although not anticipated to require implementation, could include indoor air monitoring and/or installation of shallow horizontal extraction wells and separate blower equipment outside the building footprint. Such actions would be subject to discussion and work planning through correspondence with the Property Owner, ODEQ, and Point Source.

## **REPORTING**

### ***BASELINE AND PERFORMANCE MONITORING***

Each monitoring event will be described in a brief technical memorandum submitted to the Property Owner. Upon review, the Property Owner shall distribute these technical memoranda to ODEQ and other parties as appropriate. Each technical memorandum will include the following:

- A brief summary of the work performed, methods employed during the monitoring event, and a discussion of the results.
- A site plan depicting the location of relevant features associated with the monitoring event.

- A summary of vapor sample chemical analytical data collected during the monitoring events and appended laboratory reports. The reports will also include a data quality review and associated QA/QC elements of the analytical program.
- Appended field forms and logs presenting field measurements and data.

Technical memorandum reports summarizing each monitoring event will be submitted to ODEQ within 30 days following receipt of the final laboratory analytical reports.

#### **INSPECTION AND MAINTENANCE PROGRAM**

Completed Monitoring and Maintenance Inspection Forms with supporting documentation, including photographs, maintenance records, and repair records, will be submitted to ODEQ within one month following the end of each monitoring period. If needed, follow-up inspections will be conducted to re-evaluate problem areas or confirm the completion and success of repairs. A Monitoring and Maintenance Inspection Form is presented in the Attachment.

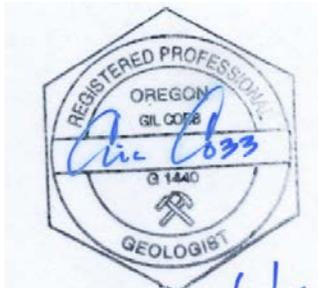
#### **INVASIVE ACTIVITIES**

Prior to undertaking any activity that may impact the integrity of the engineering controls, the Property Owner and ODEQ must be notified at least 30 days prior to project commencement. The notification will include a general description of the work to be performed, the location and depth(s) of the proposed activity, a project schedule, and proposed methods to restore the engineering controls to their original design. If DEQ determines that work and/or restoration methods are not consistent with design specifications, they will notify the Property Owner. The Property Owner will not proceed with the work until the discrepancy is resolved. If ODEQ does not notify the property owner/manager of any discrepancy within 30 days of the date of original notice, the work may proceed provided that it fully complies with the engineering specifications associated with the respective component(s).

If you have any questions regarding the information contained in this Plan, please do not hesitate to call Gil Cobb or Jeff Jackman at 503.236.5885.



Prepared by:  
Gil Cobb, Registered Geologist (Oregon #G1440)



*Expires 12/31/2021*



Reviewed By:  
Jeff Jackman, Environmental Professional

Point Source Solutions, LLC  
10445 SW Canyon Road, Suite 266  
Beaverton, Oregon 97005  
Phone: 503.236.5885

[www.pointsourcesolutions.com](http://www.pointsourcesolutions.com)

**Attachments:**

Figure 1 – Site Location Map

Figure 2 – Topographic Map

Figure 3 – Sub-Slab Monitoring Probe Details

Figure 4 – Sub-Slab Monitoring Probe Locations

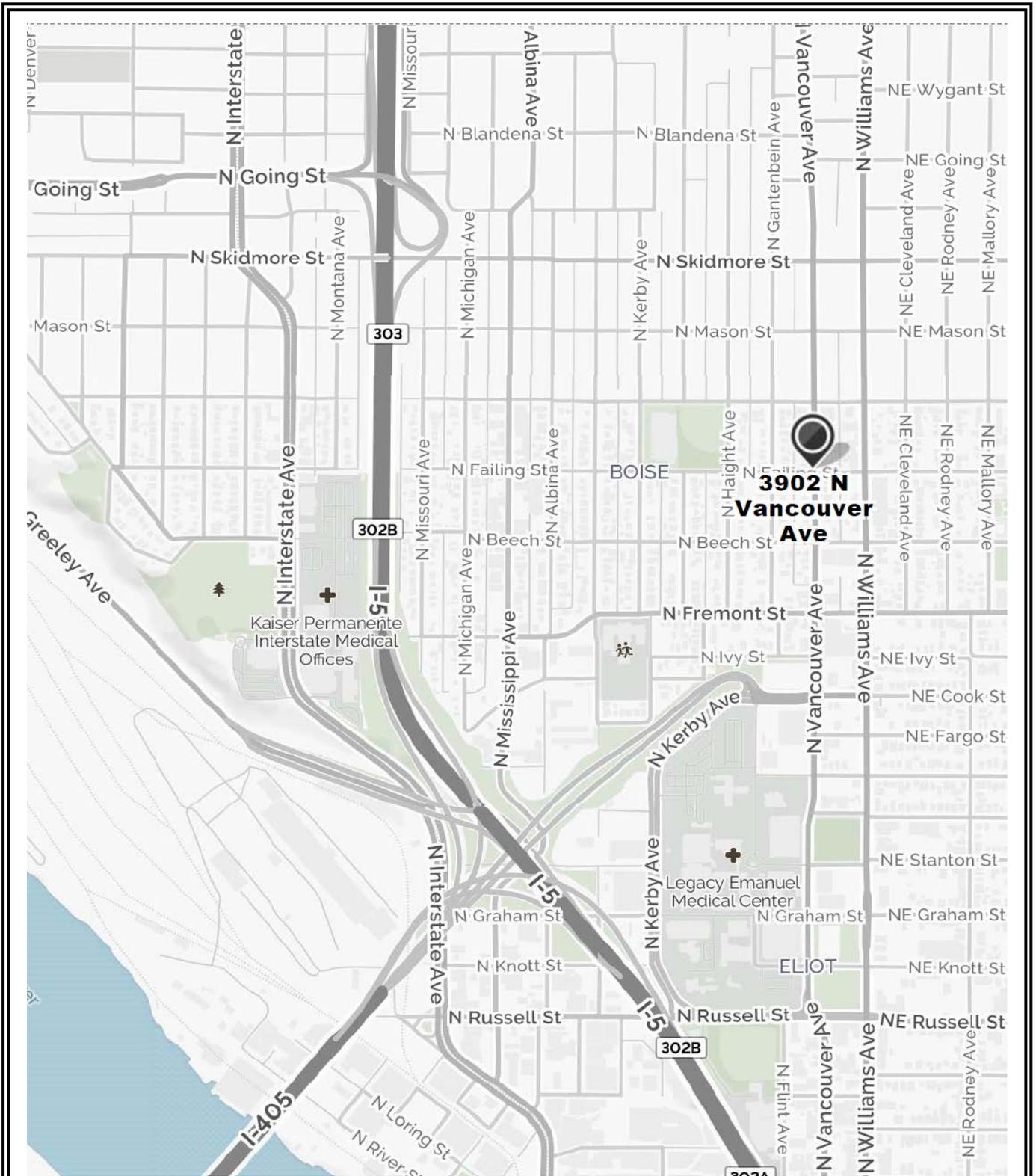
Appendix A – Vapor Pin® Standard Operating Procedures

Appendix B – Laboratory Analytical Reports

Appendix C – Photo Log

Appendix D – Field Forms

## FIGURES



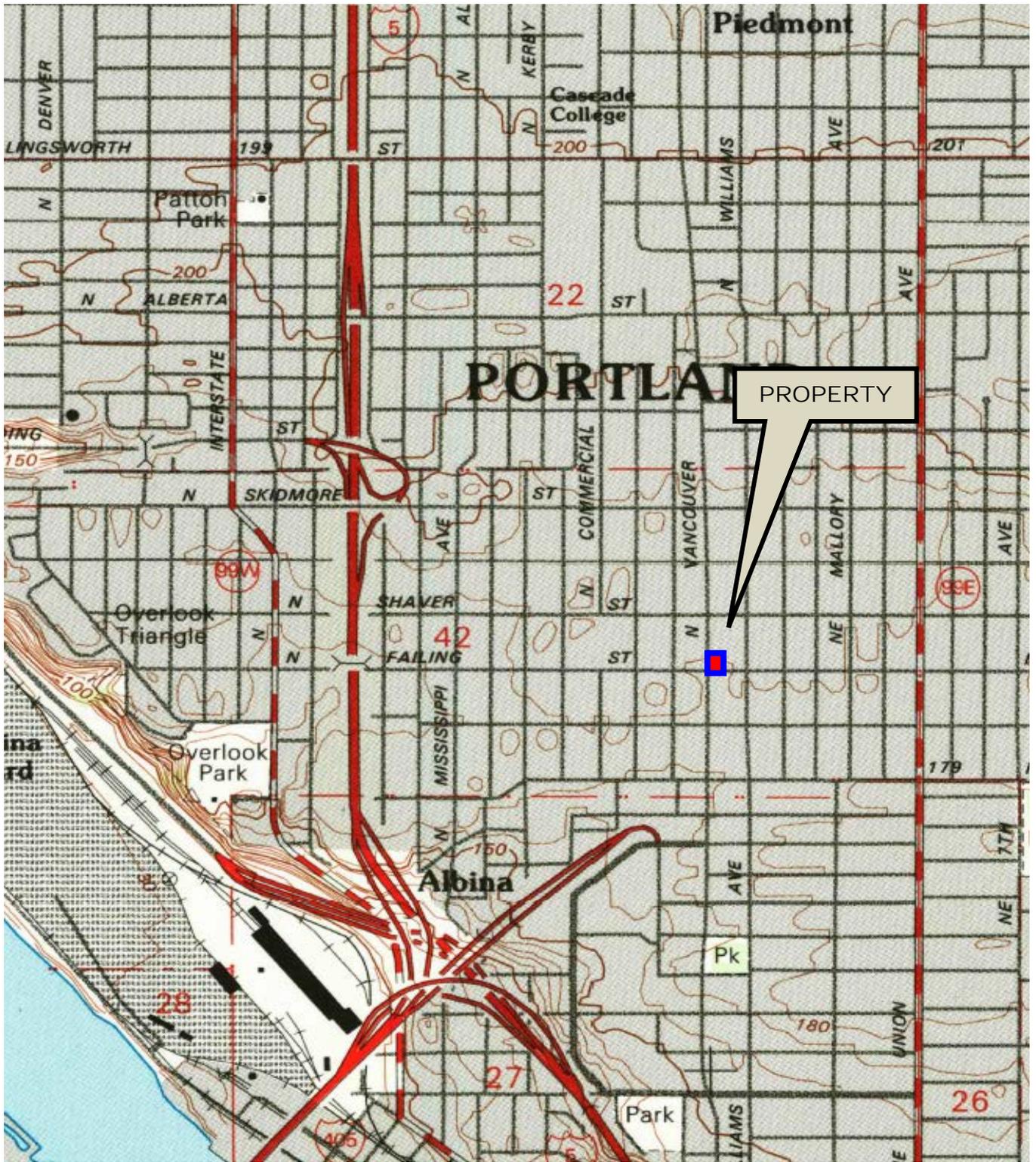
**FIGURE 1 - SITE LOCATION MAP**

Map from MapQuest



**Site Name: The Brio**  
**3912 N. Vancouver Avenue**  
**Portland, Oregon 97227**

**Project Number: OR170712-3C**



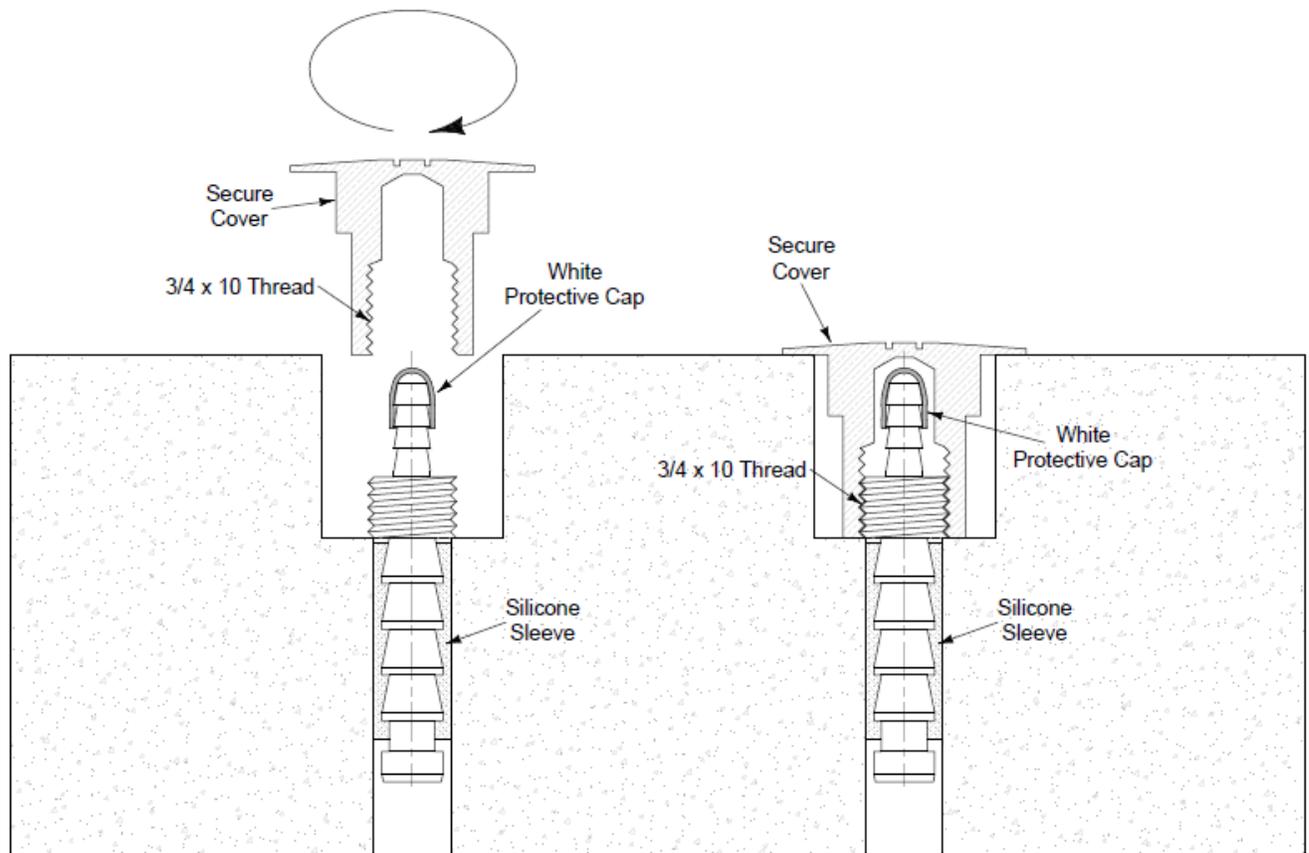
**FIGURE 2 - TOPOGRAPHIC MAP**

Source: USGS 7.5 Minute Topographic Map  
Portland, OR 1990



**Site Name: The Brio**  
3912 N. Vancouver Avenue  
Portland, Oregon 97227

**Project Number: OR170712-3C**



**FIGURE 3: Sub-Slab Monitoring Probe Details**

Image from PBS Engineering & Environmental Inc

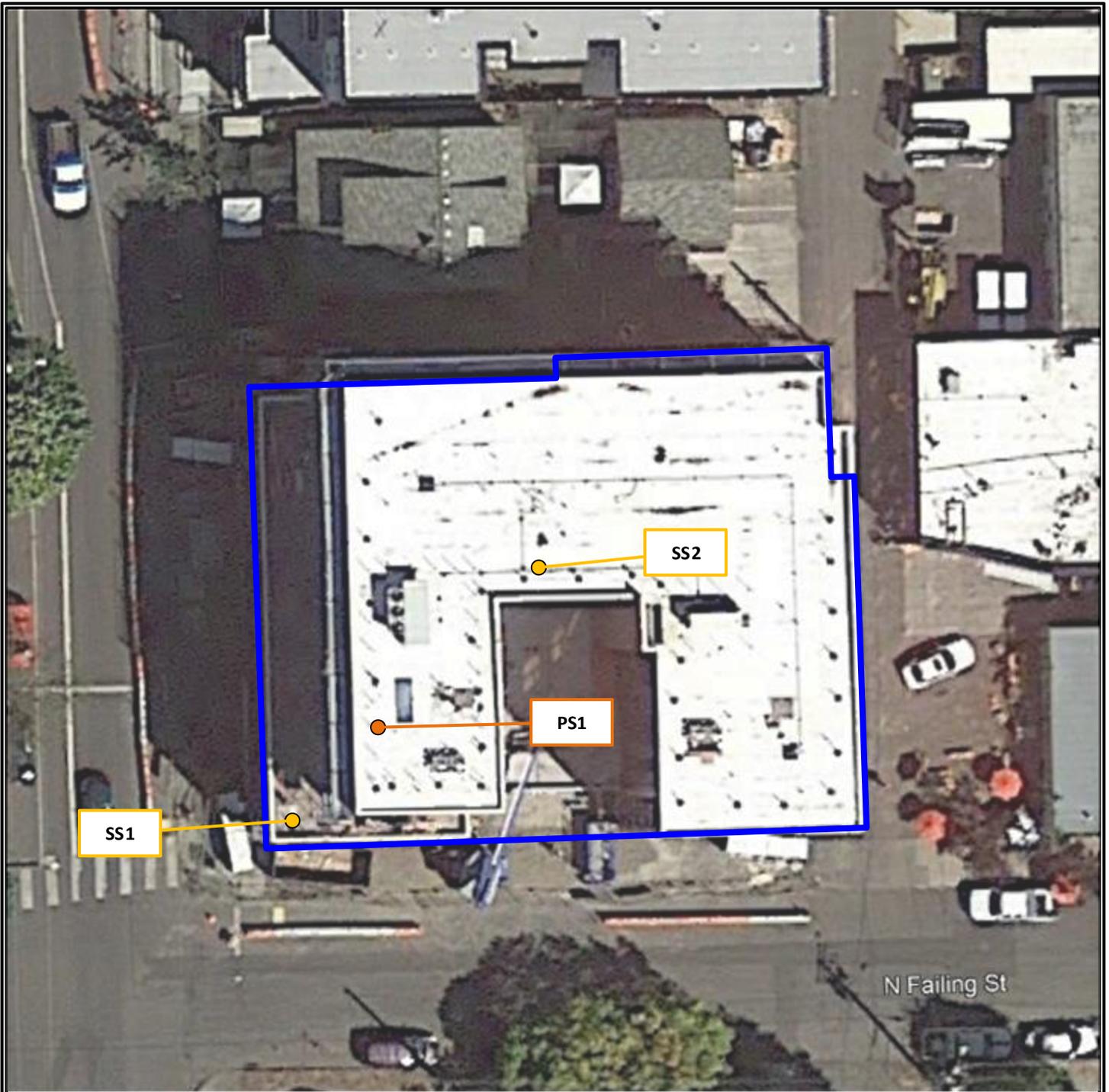


Stainless Steel Vapor Pin® and Secure Cover



**Site Name: Brio Lofts – ECSI Facility #6219**  
**3912 N Vancouver Avenue**  
**Portland, Oregon 97227**

**Project Number: OR170712-3**



**FIGURE 4: Sub-Slab Monitoring Probe Locations**

Imagery from Google Earth (2020)

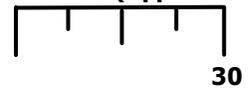


● Sub-Slab Probe Locations

● Vent Riser Sampling Port

Scale in Feet (Approximate)

□ Parking Garage Boundary



**Site Name: Brio Lofts – ECSI Facility #6219**  
**3912 N Vancouver Avenue**  
**Portland, Oregon 97227**

**Project Number: OR170712-3**

## APPENDICES

**APPENDIX A**

**VAPOR PIN® STANDARD OPERATING PROCEDURES**



# Standard Operating Procedure Installation and Extraction of the Vapor Pin® Sampling Device

Updated January 28, 2021

## Scope:

This standard operating procedure describes the installation and extraction of the VAPOR PIN® sampling device for use in sub-slab soil-gas sampling.

## Purpose:

The purpose of this procedure is to assure good quality control in field operations and uniformity between field personnel in the use of the VAPOR PIN® sampling device for the collection of sub-slab soil-gas samples or pressure readings.

## Equipment Needed:

- Assembled VAPOR PIN® sampling device [VAPOR PIN® sampling device and silicone sleeve (Figure 1)]; Because of sharp edges, gloves are recommended for sleeve installation;
- Hammer drill;
- 5/8-inch (16mm) diameter hammer bit (hole must be 5/8-inch (16mm) diameter to ensure seal. It is recommended that you use the drill guide). (Hilti™ TE-YX 5/8" x 22" (400 mm) #00206514 or equivalent);
- 1½-inch (38mm) diameter hammer bit (Hilti™ TE-YX 1½" x 23" #00293032 or equivalent) for flush mount applications;
- ¾-inch (19mm) diameter bottle brush;
- Wet/Dry vacuum with HEPA filter (optional);
- VAPOR PIN® sampling device installation/extraction tool;

- Dead blow hammer;
- VAPOR PIN® sampling device flush mount cover, if desired;
- VAPOR PIN® sampling device drilling guide, if desired;
- VAPOR PIN® sampling device protective cap; and
- VOC-free hole patching material (hydraulic cement) and putty knife or trowel for repairing the hole following the extraction of the VAPOR PIN® sampling device.



Figure 1. Assembled VAPOR PIN® sampling device

## Installation Procedure:

- 1) Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.
- 2) Set up wet/dry vacuum to collect drill cuttings.
- 3) If a flush mount installation is required, drill a 1½-inch (38mm) diameter hole at least 1¾-inches (45mm) into the slab. Use of a VAPOR PIN® sampling device drilling guide is recommended.

VAPOR PIN® sampling device protected under US Patent # 8,220,347 B2 and other US and International Patents

- 4) Drill a 5/8-inch (16mm) diameter hole through the slab and approximately 1-inch (25mm) into the underlying soil to form a void. Hole **must** be 5/8-inch (16mm) in diameter to ensure seal. It is recommended that you use the drill guide.
- 5) Remove the drill bit, brush the hole with the bottle brush, and remove the loose cuttings with the vacuum.
- 6) Place the lower end of VAPOR PIN® sampling device assembly into the drilled hole. Place the small hole located in the handle of the installation/extraction tool over the vapor pin to protect the barb fitting, and tap the vapor pin into place using a dead blow hammer (Figure 2). Make sure the installation/extraction tool is aligned parallel to the vapor pin to avoid damaging the barb fitting.



Figure 2. Installing the VAPOR PIN®

During installation, the silicone sleeve will form a slight bulge between the slab and the VAPOR PIN® sampling device shoulder. Place the protective cap on VAPOR PIN® sampling device to prevent vapor loss prior to sampling (Figure 3).



Figure 3. Installed VAPOR PIN® sampling device

- 7) For flush mount installations, cover the vapor pin with a flush mount cover, using either the plastic cover or the optional stainless-steel Secure Cover (Figure 4).



Figure 4. [Secure Cover](#) Installed

- 8) Allow 20 minutes or more (consult applicable guidance for your situation) for the sub-slab soil-gas conditions to re-equilibrate prior to sampling.
- 9) Remove protective cap and connect sample tubing to the barb fitting of the VAPOR PIN® sampling device. This connection can be made using a short

piece of Tygon™ tubing to join the VAPOR PIN® sampling device with the Nylaflow tubing (Figure 5). Put the Nylaflow tubing as close to the VAPOR PIN® sampling device as possible to minimize contact between soil gas and Tygon™ tubing.



Figure 5. VAPOR PIN® sampling device sample connection

10) Conduct leak tests in accordance with applicable guidance. If the method of leak testing is not specified, an alternative can be the use of a water dam and vacuum pump, as described in SOP Leak Testing the VAPOR PIN® sampling device via Mechanical Means (Figure 6). For flush-mount installations, distilled water can be poured directly into the 1 1/2 inch (38mm) hole.



Figure 6. Water dam used for leak detection

11) Collect sub-slab soil gas sample or pressure reading. When finished, replace the protective cap and flush mount cover until the next event. If the sampling is complete, extract the VAPOR PIN® sampling device.

#### Extraction Procedure:

- 1) Remove the protective cap, and thread the installation/extraction tool onto the barrel of the VAPOR PIN® sampling device (Figure 7). Turn the tool clockwise continuously, don't stop turning, the VAPOR PIN® sampling device will feed into the bottom of the installation/extraction tool and will extract from the hole like a wine cork, DO NOT PULL.
- 2) Fill the void with hydraulic cement and smooth with a trowel or putty knife.



Figure 7. Removing the VAPOR PIN® sampling device

- Prior to reuse, remove the silicone sleeve and protective cap and discard. Decontaminate the VAPOR PIN®

sampling device in a hot water and Alconox® wash, then heat in an oven to a temperature of 265° F (130° C) for 15 to 30 minutes. For both steps, STAINLESS – ½ hour, BRASS 8 minutes

- 3) Replacement parts and supplies are available online.



## Standard Operating Procedure Leak Testing the VAPOR PIN® Sampling Device Via Water Dam

Updated January 28, 2021

### Scope:

The operating procedure describes the methodology to test a VAPOR PIN® sampling device or equivalent sub-slab sampling device for leakage of indoor air.

### Purpose:

The purpose of this procedure is to assess the potential for indoor air to leak past the VAPOR PIN® sampling device and dilute the sub-slab soil gas sample.

### Equipment Needed:

- Water dam
- Play-Dough or VOC free modeling clay
- distilled water
- VAPOR PIN® sampling device and associated sample tubing.

### Procedure:

- 1) Drill a 5/8" diameter hole in the concrete slab and install the VAPOR PIN® sampling device as per the Standard Operating Procedure (SOP).
- 2) Clean the slab within a 2-inch radius of the VAPOR PIN® sampling device to remove dust. Avoid wetting the concrete or wait until the concrete is dry before proceeding and avoid cleaning with VOC-containing substances. A whisk broom or shop vacuum is recommended. Any remaining dust can be picked up with a

piece of scrap Play-Dough or modeling clay.

- 3) Roll a 1-inch diameter ball of Play-Doh or modeling clay between your palms to form a "snake" approximately 7 inches long and press it against the end of the water dam. Push the water dam gently against the slab to form a seal with the concrete.
- 4) Attach the sample tubing to the top of the VAPOR PIN® sampling device and pour enough distilled water into the water dam to immerse base of the VAPOR PIN®, and if desired, the tubing connection at the top of the VAPOR PIN® sampling device.
- 5) Purge the sample point as required by the data quality objectives. Concrete will absorb some of the water, which is normal; however, if water is lost to the sub-slab, stop, remove the water from the water dam, and reposition the VAPOR PIN® sampling device to stop the leakage. Reseat the leak test equipment, if needed.
- 6) If the VAPOR PIN® sampling device is installed in the flush-mount configuration, the larger hole can be filled with water in place of the water dam and Play-Dough.

Figure 1. Water dam used for leak detection



VAPOR PIN® sampling device protected under US Patent # 8,220,347 B2 and other US and International Patents

**APPENDIX B**  
**LABORATORY ANALYTICAL REPORTS**

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.  
Yelena Aravkina, M.S.  
Michael Erdahl, B.S.  
Arina Podnozova, B.S.  
Eric Young, B.S.

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(206) 285-8282  
fbi@isomedia.com  
www.friedmanandbruya.com

January 28, 2021

Gil Cobb, Project Manager  
Point Source Solutions  
10445 SW Canyon Rd., Ste. 266  
Beaverton, OR 97005

Dear Mr Cobb:

Included are the results from the testing of material submitted on January 21, 2021 from the BRIO, F&BI 101276 project. There are 7 pages included in this report.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.



Michael Erdahl  
Project Manager

Enclosures  
PSS0128R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on January 21, 2020 by Friedman & Bruya, Inc. from the Point Source Solutions BRIO, F&BI 101276 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>Point Source Solutions</u>
101276 -01	PS1
101276 -02	SS1
101276 -03	SS2

The hexane and 2-butanone (MEK) concentration in sample PS1 exceeded the calibration range of the instrument. The data were flagged accordingly.

All other quality control requirements were acceptable.

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By Method TO-17

Client Sample ID: PS1	Client:	Point Source Solutions
Date Received: 01/21/21	Project:	BRIO, F&BI 101276
Date Collected: 01/20/21	Lab ID:	101276-01
Date Analyzed: 01/21/21	Data File:	012110.D
Matrix: Air	Instrument:	GCMS10
Units: ug/m3	Operator:	bat

Compounds:	Concentration ug/m3	Compounds:	Concentration ug/m3
Dichlorodifluoromethane	26	1,2-Dibromoethane (EDB)	<5
Vinyl chloride	<5	Chlorobenzene	<1
2-Propanol	<250	Ethylbenzene	<5
1,1-Dichloroethene	<10	1,1,1,2-Tetrachloroethane	<5
Hexane	310 ve	m,p-Xylene	<10
t-Butyl alcohol (TBA)	<250	o-Xylene	<5
Methyl t-butyl ether (MTBE)	<25	Styrene	<5
trans-1,2-Dichloroethene	<5	Isopropylbenzene	<5
1,1-Dichloroethane	<5	Bromoform	<5
2,2-Dichloropropane	<5	n-Propylbenzene	<1
cis-1,2-Dichloroethene	<5	Bromobenzene	<1
Chloroform	<5	1,3,5-Trimethylbenzene	<1
2-Butanone (MEK)	1,200 ve	1,1,2,2-Tetrachloroethane	<1
1,2-Dichloroethane (EDC)	<5	1,2,3-Trichloropropane	<1
1,1,1-Trichloroethane	6.4	2-Chlorotoluene	<1
1,1-Dichloropropene	<5	4-Chlorotoluene	<1
Carbon tetrachloride	<5	tert-Butylbenzene	<1
Benzene	40	1,2,4-Trimethylbenzene	2.6
Trichloroethene	4.0	sec-Butylbenzene	<1
1,2-Dichloropropane	<5	p-Isopropyltoluene	<2
Bromodichloromethane	<5	1,3-Dichlorobenzene	<1
Dibromomethane	<5	1,4-Dichlorobenzene	<1
4-Methyl-2-pentanone	<5	1,2-Dichlorobenzene	<1
cis-1,3-Dichloropropene	<5	1,2-Dibromo-3-chloropropane	<1
Toluene	8.5	1,2,4-Trichlorobenzene	<1
trans-1,3-Dichloropropene	<1	Hexachlorobutadiene	<1
1,1,2-Trichloroethane	<1	Naphthalene	<1
2-Hexanone	<25	1,2,3-Trichlorobenzene	<5
1,3-Dichloropropane	<1	2-Methylnaphthalene	<10
Tetrachloroethene	7.0	1-Methylnaphthalene	<10
Dibromochloromethane	5.3	Gasoline Range Organics	<2500

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By Method TO-17

Client Sample ID: SS1	Client:	Point Source Solutions
Date Received: 01/21/21	Project:	BRIO, F&BI 101276
Date Collected: 01/20/21	Lab ID:	101276-02
Date Analyzed: 01/21/21	Data File:	012111.D
Matrix: Air	Instrument:	GCMS10
Units: ug/m3	Operator:	bat

Compounds:	Concentration ug/m3	Compounds:	Concentration ug/m3
Dichlorodifluoromethane	<25	1,2-Dibromoethane (EDB)	<5
Vinyl chloride	<5	Chlorobenzene	<1
2-Propanol	<250	Ethylbenzene	<5
1,1-Dichloroethene	<10	1,1,1,2-Tetrachloroethane	<5
Hexane	<25	m,p-Xylene	<10
t-Butyl alcohol (TBA)	<250	o-Xylene	<5
Methyl t-butyl ether (MTBE)	<25	Styrene	<5
trans-1,2-Dichloroethene	<5	Isopropylbenzene	<5
1,1-Dichloroethane	<5	Bromoform	<5
2,2-Dichloropropane	<5	n-Propylbenzene	<1
cis-1,2-Dichloroethene	<5	Bromobenzene	<1
Chloroform	<5	1,3,5-Trimethylbenzene	<1
2-Butanone (MEK)	<25	1,1,2,2-Tetrachloroethane	<1
1,2-Dichloroethane (EDC)	<5	1,2,3-Trichloropropane	<1
1,1,1-Trichloroethane	<5	2-Chlorotoluene	<1
1,1-Dichloropropene	<5	4-Chlorotoluene	<1
Carbon tetrachloride	<5	tert-Butylbenzene	<1
Benzene	<20	1,2,4-Trimethylbenzene	3.1
Trichloroethene	1.3	sec-Butylbenzene	<1
1,2-Dichloropropane	<5	p-Isopropyltoluene	<2
Bromodichloromethane	<5	1,3-Dichlorobenzene	<1
Dibromomethane	<5	1,4-Dichlorobenzene	<1
4-Methyl-2-pentanone	<5	1,2-Dichlorobenzene	<1
cis-1,3-Dichloropropene	<5	1,2-Dibromo-3-chloropropane	<1
Toluene	7.4	1,2,4-Trichlorobenzene	<1
trans-1,3-Dichloropropene	<1	Hexachlorobutadiene	<1
1,1,2-Trichloroethane	<1	Naphthalene	<1
2-Hexanone	<25	1,2,3-Trichlorobenzene	<5
1,3-Dichloropropane	<1	2-Methylnaphthalene	<10
Tetrachloroethene	4.1	1-Methylnaphthalene	<10
Dibromochloromethane	<5	Gasoline Range Organics	<2500

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By Method TO-17

Client Sample ID: SS2	Client:	Point Source Solutions
Date Received: 01/21/21	Project:	BRIO, F&BI 101276
Date Collected: 01/20/21	Lab ID:	101276-03
Date Analyzed: 01/21/21	Data File:	012112.D
Matrix: Air	Instrument:	GCMS10
Units: ug/m3	Operator:	bat

Compounds:	Concentration ug/m3	Compounds:	Concentration ug/m3
Dichlorodifluoromethane	33	1,2-Dibromoethane (EDB)	<5
Vinyl chloride	<5	Chlorobenzene	<1
2-Propanol	<250	Ethylbenzene	<5
1,1-Dichloroethene	<10	1,1,1,2-Tetrachloroethane	<5
Hexane	<25	m,p-Xylene	<10
t-Butyl alcohol (TBA)	<250	o-Xylene	<5
Methyl t-butyl ether (MTBE)	<25	Styrene	<5
trans-1,2-Dichloroethene	<5	Isopropylbenzene	<5
1,1-Dichloroethane	<5	Bromoform	<5
2,2-Dichloropropane	<5	n-Propylbenzene	<1
cis-1,2-Dichloroethene	<5	Bromobenzene	<1
Chloroform	<5	1,3,5-Trimethylbenzene	<1
2-Butanone (MEK)	<25	1,1,2,2-Tetrachloroethane	<1
1,2-Dichloroethane (EDC)	<5	1,2,3-Trichloropropane	<1
1,1,1-Trichloroethane	10	2-Chlorotoluene	<1
1,1-Dichloropropene	<5	4-Chlorotoluene	<1
Carbon tetrachloride	<5	tert-Butylbenzene	<1
Benzene	<20	1,2,4-Trimethylbenzene	3.6
Trichloroethene	8.6	sec-Butylbenzene	<1
1,2-Dichloropropane	<5	p-Isopropyltoluene	<2
Bromodichloromethane	<5	1,3-Dichlorobenzene	<1
Dibromomethane	<5	1,4-Dichlorobenzene	<1
4-Methyl-2-pentanone	<5	1,2-Dichlorobenzene	<1
cis-1,3-Dichloropropene	<5	1,2-Dibromo-3-chloropropane	<1
Toluene	7.7	1,2,4-Trichlorobenzene	<1
trans-1,3-Dichloropropene	<1	Hexachlorobutadiene	<1
1,1,2-Trichloroethane	<1	Naphthalene	<1
2-Hexanone	<25	1,2,3-Trichlorobenzene	<5
1,3-Dichloropropane	<1	2-Methylnaphthalene	<10
Tetrachloroethene	30	1-Methylnaphthalene	<10
Dibromochloromethane	<5	Gasoline Range Organics	<2500

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By Method TO-17

Client Sample ID:	Method Blank	Client:	Point Source Solutions
Date Received:	Not Applicable	Project:	BRIO, F&BI 101276
Date Collected:	Not Applicable	Lab ID:	01-167 mb
Date Analyzed:	01/21/21	Data File:	012109.D
Matrix:	Air	Instrument:	GCMS10
Units:	ug/m3	Operator:	bat

Compounds:	Concentration ug/m3	Compounds:	Concentration ug/m3
Dichlorodifluoromethane	<25	1,2-Dibromoethane (EDB)	<5
Vinyl chloride	<5	Chlorobenzene	<1
2-Propanol	<250	Ethylbenzene	<5
1,1-Dichloroethene	<10	1,1,1,2-Tetrachloroethane	<5
Hexane	<25	m,p-Xylene	<10
t-Butyl alcohol (TBA)	<250	o-Xylene	<5
Methyl t-butyl ether (MTBE)	<25	Styrene	<5
trans-1,2-Dichloroethene	<5	Isopropylbenzene	<5
1,1-Dichloroethane	<5	Bromoform	<5
2,2-Dichloropropane	<5	n-Propylbenzene	<1
cis-1,2-Dichloroethene	<5	Bromobenzene	<1
Chloroform	<5	1,3,5-Trimethylbenzene	<1
2-Butanone (MEK)	<25	1,1,2,2-Tetrachloroethane	<1
1,2-Dichloroethane (EDC)	<5	1,2,3-Trichloropropane	<1
1,1,1-Trichloroethane	<5	2-Chlorotoluene	<1
1,1-Dichloropropene	<5	4-Chlorotoluene	<1
Carbon tetrachloride	<5	tert-Butylbenzene	<1
Benzene	<20	1,2,4-Trimethylbenzene	<1
Trichloroethene	<1	sec-Butylbenzene	<1
1,2-Dichloropropane	<5	p-Isopropyltoluene	<2
Bromodichloromethane	<5	1,3-Dichlorobenzene	<1
Dibromomethane	<5	1,4-Dichlorobenzene	<1
4-Methyl-2-pentanone	<5	1,2-Dichlorobenzene	<1
cis-1,3-Dichloropropene	<5	1,2-Dibromo-3-chloropropane	<1
Toluene	<5	1,2,4-Trichlorobenzene	<1
trans-1,3-Dichloropropene	<1	Hexachlorobutadiene	<1
1,1,2-Trichloroethane	<1	Naphthalene	<1
2-Hexanone	<25	1,2,3-Trichlorobenzene	<5
1,3-Dichloropropane	<1	2-Methylnaphthalene	<10
Tetrachloroethene	<1	1-Methylnaphthalene	<10
Dibromochloromethane	<5	Gasoline Range Organics	<2500

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 01/28/21

Date Received: 01/21/21

Project: BRIO, F&BI 101276

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES  
FOR VOLATILES BY METHOD TO-17**

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Dichlorodifluoromethane	ng/tube	50	81	70-130
Vinyl chloride	ng/tube	50	97	70-130
2-Propanol	ng/tube	250	115	70-130
1,1-Dichloroethene	ng/tube	50	98	70-130
Hexane	ng/tube	50	84	70-130
t-Butyl alcohol (TBA)	ng/tube	250	99	70-130
Methyl t-butyl ether (MTBE)	ng/tube	50	97	70-130
trans-1,2-Dichloroethene	ng/tube	50	100	70-130
1,1-Dichloroethane	ng/tube	50	99	70-130
2,2-Dichloropropane	ng/tube	50	99	70-130
cis-1,2-Dichloroethene	ng/tube	50	98	70-130
Chloroform	ng/tube	50	99	70-130
2-Butanone (MEK)	ng/tube	50	91	70-130
1,2-Dichloroethane (EDC)	ng/tube	50	98	70-130
1,1,1-Trichloroethane	ng/tube	50	100	70-130
1,1-Dichloropropene	ng/tube	50	95	70-130
Carbon tetrachloride	ng/tube	50	101	70-130
Benzene	ng/tube	50	87	70-130
Trichloroethene	ng/tube	50	100	70-130
1,2-Dichloropropane	ng/tube	50	97	70-130
Bromodichloromethane	ng/tube	50	100	70-130
Dibromomethane	ng/tube	50	100	70-130
4-Methyl-2-pentanone	ng/tube	50	95	70-130
cis-1,3-Dichloropropene	ng/tube	50	98	70-130
Toluene	ng/tube	50	93	70-130
trans-1,3-Dichloropropene	ng/tube	50	96	70-130
1,1,2-Trichloroethane	ng/tube	50	92	70-130
2-Hexanone	ng/tube	50	104	70-130
1,3-Dichloropropane	ng/tube	50	93	70-130
Tetrachloroethene	ng/tube	50	97	70-130
Dibromochloromethane	ng/tube	50	99	70-130
1,2-Dibromoethane (EDB)	ng/tube	50	97	70-130
Chlorobenzene	ng/tube	50	98	70-130
Ethylbenzene	ng/tube	50	95	70-130
1,1,1,2-Tetrachloroethane	ng/tube	50	98	70-130
m,p-Xylene	ng/tube	100	97	70-130
o-Xylene	ng/tube	50	96	70-130
Styrene	ng/tube	50	94	70-130
Isopropylbenzene	ng/tube	50	95	70-130
Bromoform	ng/tube	50	98	70-130
n-Propylbenzene	ng/tube	50	95	70-130
Bromobenzene	ng/tube	50	98	70-130
1,3,5-Trimethylbenzene	ng/tube	50	93	70-130
1,1,2,2-Tetrachloroethane	ng/tube	50	93	70-130
1,2,3-Trichloropropane	ng/tube	50	94	70-130
2-Chlorotoluene	ng/tube	50	94	70-130
4-Chlorotoluene	ng/tube	50	95	70-130
tert-Butylbenzene	ng/tube	50	94	70-130
1,2,4-Trimethylbenzene	ng/tube	50	94	70-130
sec-Butylbenzene	ng/tube	50	95	70-130
p-Isopropyltoluene	ng/tube	50	95	70-130
1,3-Dichlorobenzene	ng/tube	50	96	70-130
1,4-Dichlorobenzene	ng/tube	50	96	70-130
1,2-Dichlorobenzene	ng/tube	50	96	70-130
1,2-Dibromo-3-chloropropane	ng/tube	50	89	70-130
1,2,4-Trichlorobenzene	ng/tube	50	93	70-130
Hexachlorobutadiene	ng/tube	50	96	70-130
Naphthalene	ng/tube	50	93	70-130
1,2,3-Trichlorobenzene	ng/tube	50	95	70-130
2-Methylnaphthalene	ng/tube	50	90	70-130
1-Methylnaphthalene	ng/tube	50	91	70-130

# FRIEDMAN & BRUYA, INC.

## ENVIRONMENTAL CHEMISTS

### **Data Qualifiers & Definitions**

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The analyte is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht - The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits due to sample matrix effects.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

101276

SAMPLE CHAIN OF CUSTODY

01-21-20

Page # 1 of 1

Report To Gil Cobb

Company Point Source Solutions

Address 10445 SW Canyon Rd Ste 266

City, State, ZIP Beverton, OR 97005

Phone (503) 916-9254 Email gil@pointsource.com

SAMPLES (signature) 

PROJECT NAME BRIO PO #

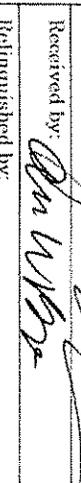
REMARKS INVOICE TO

TURNAROUND TIME  
Standard (10 Business Days)  
RUSH  
Rush charges authorized by:

SAMPLE DISPOSAL  
 Dispose after 30 days  
 Archive Samples  
 Other

Sample Name	Lab ID	Tube ID	Sample Date	Collection Information		Start Time	End Time	Volume Sampled	TO-17 Analytes Requested							Notes		
				Pre-Flow Rate	Post-Flow Rate				Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	TPH-DRO	2-Propanol		TPH-GRO	Full list VOCs
PS1	01	309145	1/20/21	100 mL/min	100 mL/min	10:16	10:26	1 L								X		
SS1	02	311389	1/20/21	100 mL/min	100 mL/min	10:39	10:49	1 L								X		
SS2	03	322153	1/20/21	100 mL/min	100 mL/min	11:14	11:24	1 L								X		

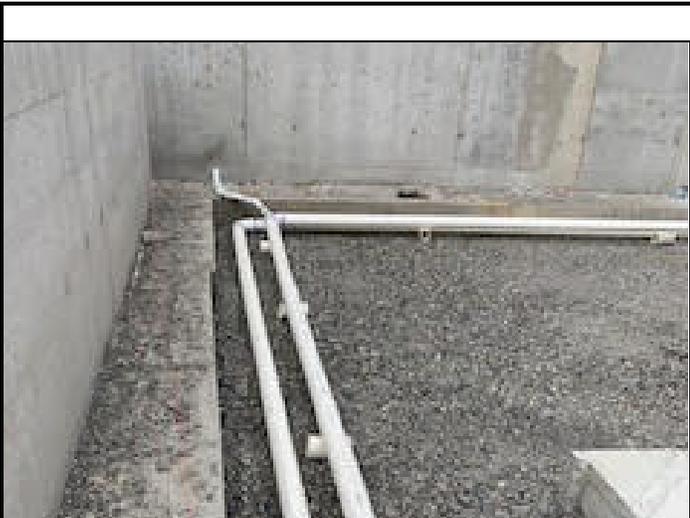
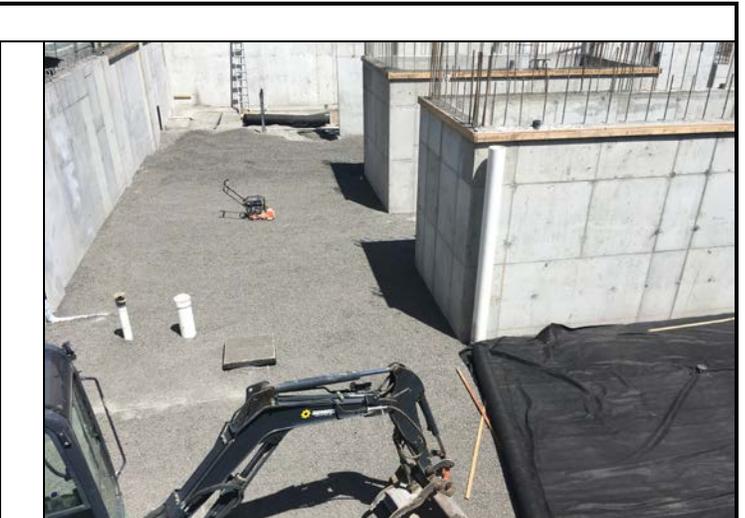
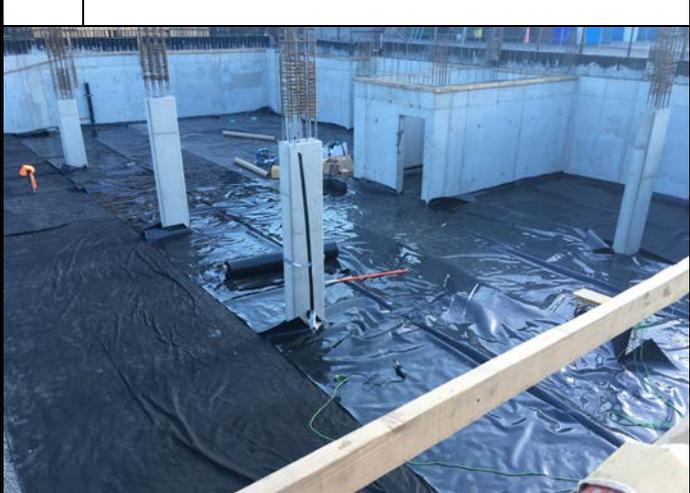
Samples received at 4 °C

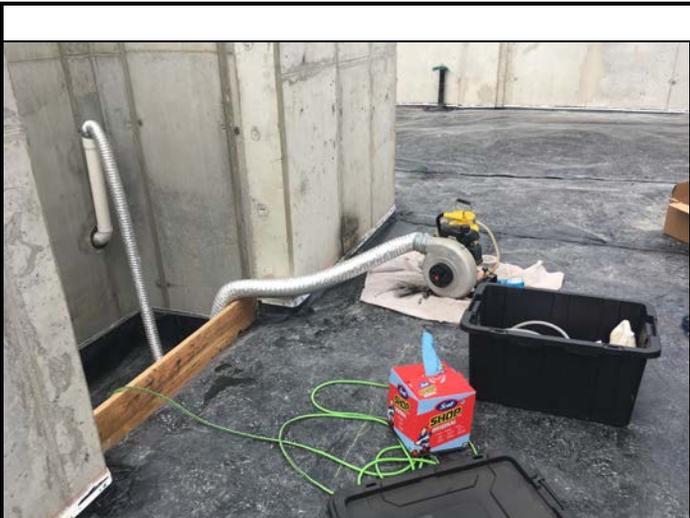
SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
	Kyle Fisher	PSS	1/20/21	15:57
	Ann W-Bryce	FRB	1/21/20	10:50
Received by:				
Received by:				

Friedman & Bruga, Inc.  
 3012 16th Avenue West  
 Seattle, WA 98119-2029  
 Ph. (206) 285-8282  
 Fax (206) 283-5044

## **APPENDIX C**

## **PHOTO LOG**

	
<p>Photo #1: View of Perforated PVC Installation</p>	<p>Photo #2: View of Aggregate Material underneath Geomembrane</p>
	
<p>Photo #3: View of Absolute Barrier® Installation</p>	<p>Photo #4: View of DemTech Wedge Welder</p>
	
<p>Photo #5: View of Certified Extrusion Weld</p>	<p>Photo #6: View of Completed Section of Barrier</p>

			
Photo #7:	View of Smoke Test Equipment	Photo #8:	View of PBS Engineer Inspecting Absolute Barrier® for Leaks
			
Photo #9:	View of Vent Riser to Sampling Port Connection through Elevator Shaft	Photo #10:	View of Vent Riser Sampling Port in Parking Garage (Enclosure not yet installed)
			
Photo #11:	View of Stainless Steel Vapor Pin®	Photo #12:	View of Vapor Pin® Secure Cover

## **APPENDIX D**

## **FIELD FORMS**

PROJECT: 3912 N Vancouver Ave		PM: Gil Cobb	DATE: 1-20-21	
CONDITIONS: Interior samples (parking garage) No obvious ambient air issues.				
LOCATION: PSI - sample port		SAMPLE ID: PSI		
Soil Gas or <u>Sub-slab</u> (circle one)	TO-15 or <u>TO-17</u> (circle one)	SN: 309145	Ti 10:16a	Tr 10:26a
SAMPLE DEPTH: —	Flow Rate: 100 mL/min	Reg ID: —	Pi —	Pr —
Time	Task Description			
10:00	<p>Evaluated vent riser sampling port for proper function. Attached tubing assembly w/ master flex &amp; teflon tubing to begin purging using Pocket pump. opened ball valve to began purging. Assembled TO-17 sample train w/ 2 prop leak check. After purging connected TO-17 sample train, then sampled for 10 mins @ 100 mL/min for a total of 1 liter.</p>			
LOCATION: SS1 - SW corner		SAMPLE ID: SS1		
Soil Gas or <u>Sub-slab</u> (circle one)	TO-15 or <u>TO-17</u> (circle one)	SN: 311369	Ti 10:39a	Tr 10:49a
SAMPLE DEPTH: —	Flow Rate: 100 mL/min	Reg ID: —	Pi —	Pr —
Time	Task Description			
10:27	<p>Uncovered Vapor Pin flush mount cover &amp; protective cap. Attached tubing, began purging for 3 mins. Assembled TO-17 sample train. After purging, connected sample train w/ 2 prop leak check (water dam is within flush mount). Collected for 10 mins @ 100 mL/min for 1 liter.</p>			
LOCATION: SS2 - central		SAMPLE ID: SS2		
Soil Gas or <u>Sub-slab</u> (circle one)	TO-15 or <u>TO-17</u> (circle one)	SN: 322153	Ti 11:14	Tr 11:24
SAMPLE DEPTH: —	Flow Rate: 100 mL/min	Reg ID: —	Pi —	Pr —
Time	Task Description			
11:05	<p>Uncovered vapor pin flushmount cover &amp; protective cap. Attached tubing, began purging w/ pocket pump for 3 minutes. Assembled TO-17 sample train. After purging, connected sample train w/ 2 prop leak check &amp; water dam in flush mount. collected for 10 mins @ 100 mL/min for 1 liter of vapor.</p>			

## **APPENDIX H**

# **ECOLOGICAL RISK ASSESSMENT**

## Basic Site Information Checklist

(Appendix A1, “Conducting Ecological Risk Assessments”, Oregon DEQ, September 2020)

General Site Information		
<b>ECSI File No. or LUST File No.:</b> ECSI No. 6219		
<b>Site Name:</b> Solterra Property		
<b>Site Location (address, city, and/or county):</b> 3912 North Vancouver Avenue, Portland, Oregon 97227		
<b>Latitude/Longitude:</b> 45.551035 N, -122.667627 W		
<b>Current Site Use:</b> Multi-family residential units, three restaurants, and two unoccupied retail tenant spaces		
<b>Historical Site Use:</b> Service station and auto repair (1936-1964). Vacant land (1964-2018). Mixed-use commercial (2018-Present).		
<b>Zoning:</b> CM3 – Commercial Mixed Use by City of Portland		
<b>Site Features:</b> One four-story, 45,000 sq. ft mixed-use commercial building with five retail spaces on the ground floor and multi-family residential units on upper floors. Underground parking garage in the basement of the building. Served by City of Portland water and sanitary sewer.		
<b>Chemicals of Interest:</b> Trichloroethene (TCE), Benzene, Chloroform, Xylenes, Toluene, Ethylbenzene, Gasoline and Diesel Range Organics		
Site Conditions – Provide Approximate Areas (acreage or square-feet)		
Site	Within ¼ mile	
No	Yes	<b>Terrestrial Open Habitat/Grasslands:</b> Dominated by short to medium-tall grasses, low to medium shrubs, or bare soil.  Denorval Unthank Park (approximately 30,000 sq. ft. of open habitat) is within a ¼ mile of the site.
No	No	<b>Forest or Woodland Habitats:</b> Woodlands (maple, alder, aspen), conifer forest (Douglas fir, hemlock, cedar, spruce), mixed-woodland, juniper, pine (ponderosa, lodgepole)
No	No	<b>Wetland:</b> May be either tidal or non-tidal wetlands with emergent

		herbaceous plants.
No	No	<b>Riparian Zone:</b> Patches or linear strips of land adjacent to waterbodies (rivers, streams, waterbodies), or on nearby floodplains and terraces. May be impacted by periodic riverine flooding or perennial flowing water. May or may not also contain wetlands.
No	No	<b>Aquatic Open Water:</b> Ponds, lakes, reservoirs, rivers, creeks, streams, bays, estuaries, and nearshore marine and intertidal.
Yes	Yes	<b>Impermeable Surface:</b> Pavement, structures. The Site and surrounding areas are fully paved with asphalt and concrete.

**Documentation (attached)**

Aerial Site Vicinity Map(s). **(Figure 1)**, Topographic Map. **(Figure 2)**

Site Plan identifying Site features. **(Figure 3)**

Figure illustrating former excavations, former UST locations, sample locations, and surface features. **(Figures 4-5)**

Aerial Map showing habitat types described above both within and adjacent to the Site by at least ¼ mile from Site boundary. **(Figure 8)**

**Summary of known or potential contaminated soil, groundwater, migration pathways:**

Known gasoline and diesel range organics and associated VOC impacted soil remains in place deep beneath the subgrade parking lot of the building, capped by a vapor barrier and passive ventilation system below the concrete floor. Groundwater is found at over 100 feet below ground surface and has not been impacted by this historical release.

No significant on-site exposure pathways have been identified for ecological receptors.

**Checklist Completed By:**

**Name:** Kyle Fisher

**Title:** Environmental Technician, Point Source Solutions

**Expertise:** BA, Environmental Studies

**Date:** September 15, 2022